Installation Manual
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Micro Motion® Model 1700 and 2700

Installation Manual

Micro Motion®

EMERSON™
Process Management

Safety messages

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

Micro Motion customer service

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1 Planning

Topics covered in this chapter:

-)ORZPHWHU FRPSRQHQWV
- 2XWSXWV RSWLRQ LGHQWLILFDWLRQ
- (QYLURQPHQWDO OLPLWV
- +D]DUGRXV DUHD FODVVLILFDWLRQV
- 3RZHU UHTXLUHPHQWV
- 2ULHQWDWLRQ
- $FFHVVLELOLW\ IRU PDLQWHQDQFH

1.1 Flowmeter components

The transmitter is one component of a Micro Motion flowmeter. The other major component is the sensor.

A third component, called the core processor, provides additional memory and processing functions.

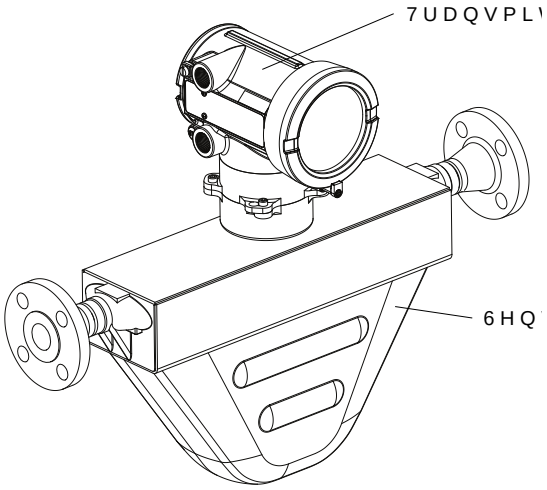
1.1.1 Installation types

Identify your installation type before proceeding with the installation.

Model 1700 and 2700 transmitters can be installed five different ways, only one of which will apply to your specific installation.

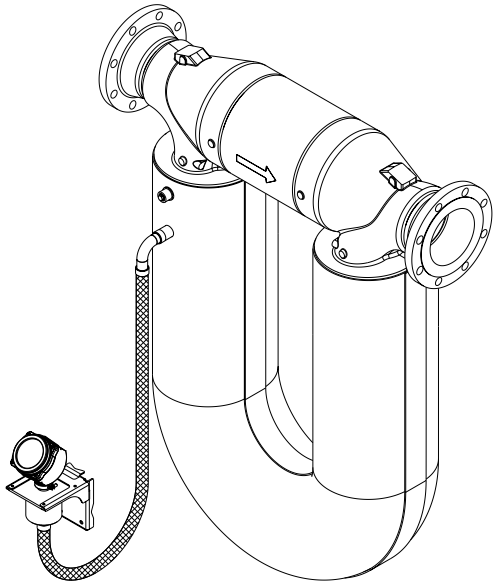
- **Integral** – The transmitter is mounted directly on the sensor. You do not need to install the transmitter separately, but you will need to connect power supply and I/O wiring.

Figure 1-1: Integral installation



- **High-temperature flexible conduit** – Some high-temperature meters come preinstalled with a flexible conduit between the sensor and the transmitter. You do not have to connect any wires between the transmitter and the sensor, but you do need to mount the electronics separately and connect power and I/O wiring to the transmitter.

Figure 1-2: High-temperature flexible conduit installation



High-temperature flexible conduit installations use the same installation instructions as 4-wire remote installations, except that the distance between the sensor and the electronics is limited by the length of the flexible conduit.

- **4-wire remote** – The transmitter is installed remotely from the sensor. You need to mount the transmitter separately from the sensor, connect a 4-wire cable between the transmitter and sensor, and connect power and I/O wiring to the transmitter.

Figure 1-3: 4-wire remote installation – painted aluminum housing

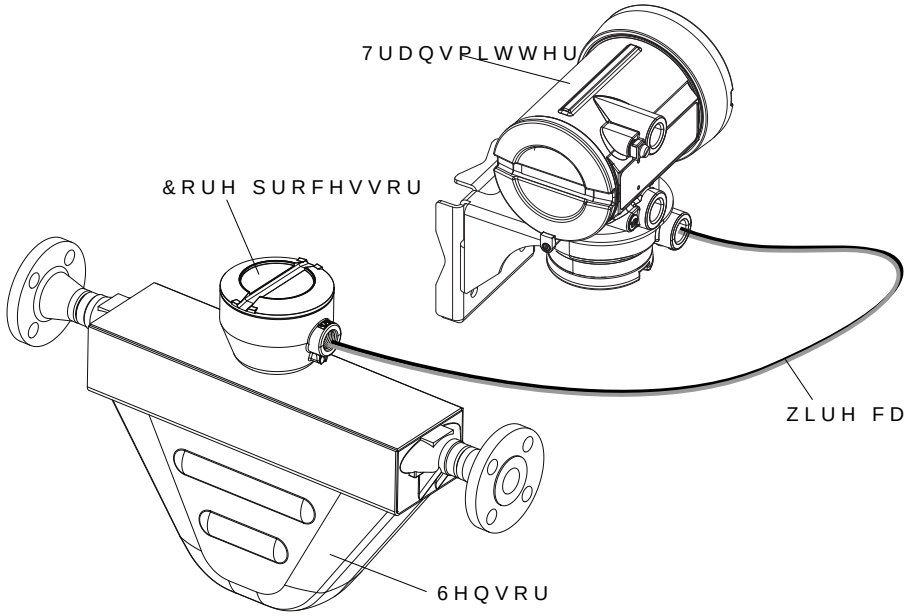
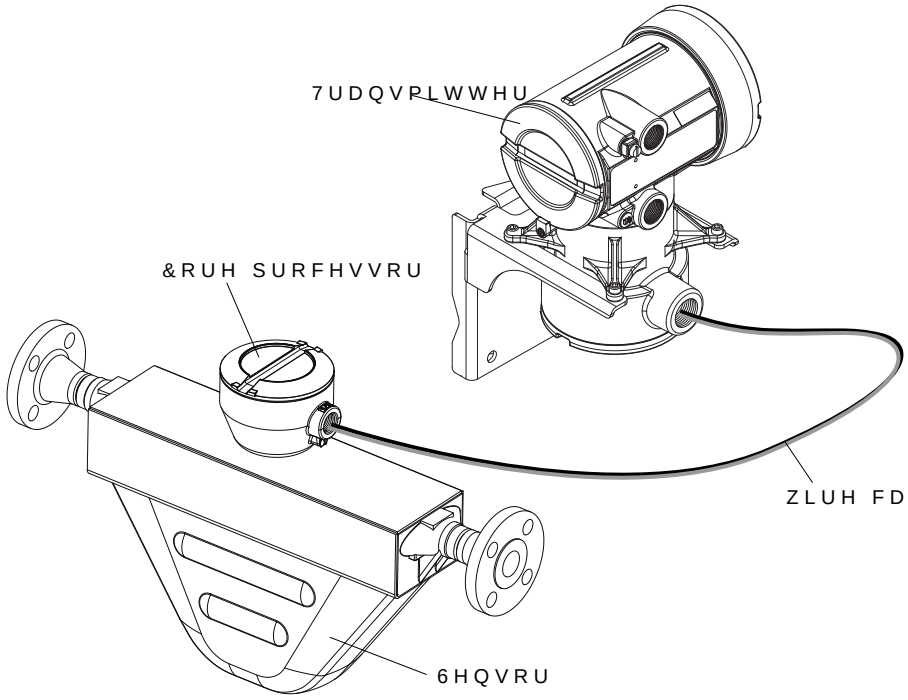
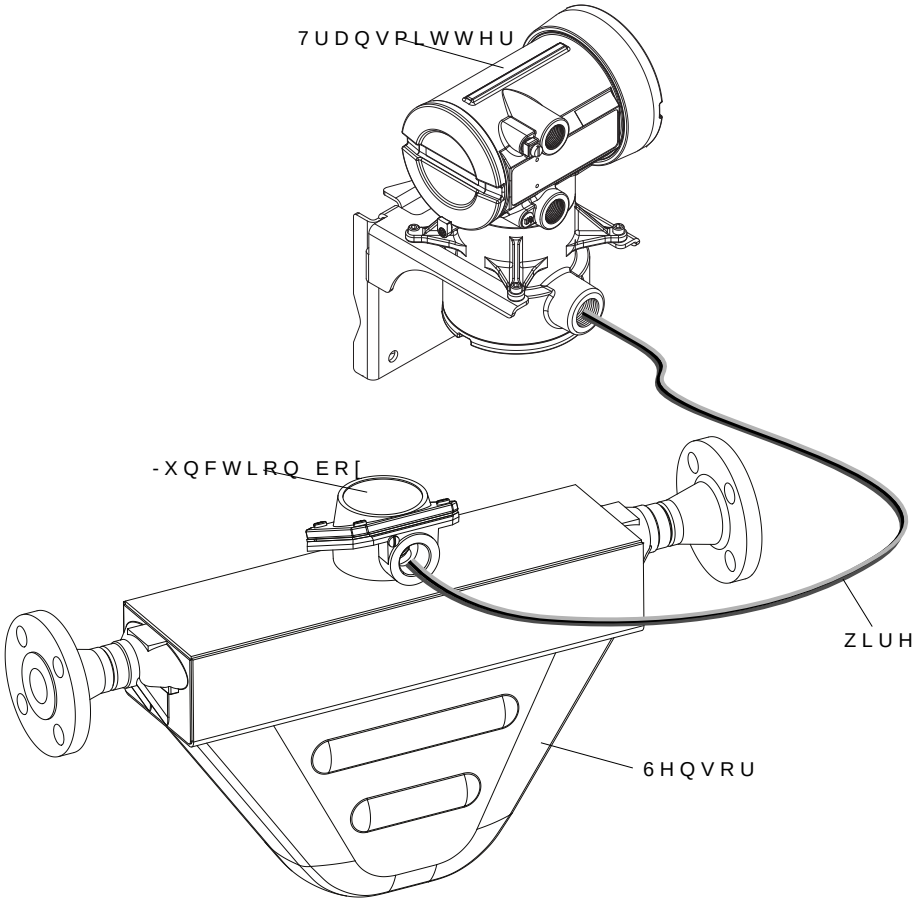


Figure 1-4: 4-wire remote installation – stainless steel housing



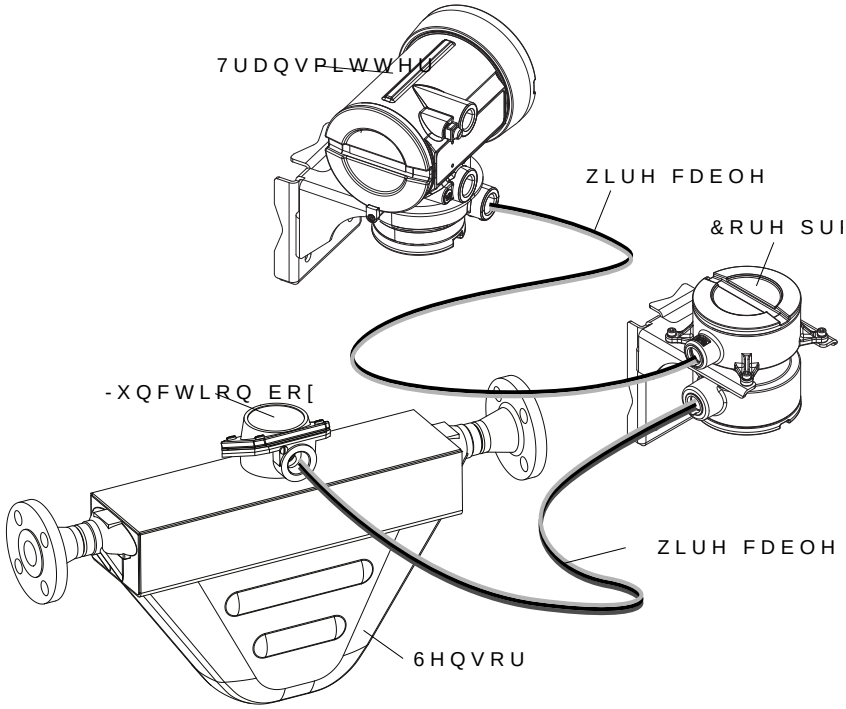
- **9-wire remote** – The transmitter and core processor are combined in a single unit that is installed remotely from the sensor. You need to mount the transmitter/core processor assembly separately from the sensor, connect a 9-wire cable between the transmitter/core processor, and connect power and I/O wiring to the transmitter.

Figure 1-5: 9-wire remote installation type



- **Remote core processor with remote sensor** – A remote core process with remote sensor installation separates all three components – transmitter, core processor, and sensor – all of which are installed separately. A 4-wire cable connects the transmitter to the core processor, and a 9-wire cable connects the core processor to the sensor.

Figure 1-6: Remote core processor with remote sensor installation type



1.1.2 Maximum cable lengths

The maximum cable length between flowmeter components that are separately installed is determined by cable type. See 7 D E O.H

Table 1-1: Maximum cable lengths

Cable type	Wire gauge	Maximum length
Micro Motion 4-wire	Not applicable	1000 ft (300 m)
Micro Motion 9-wire	Not applicable	60 ft (20 m)
User-supplied 4-wire	VDC 22 AWG (0.35 mm^2)	300 ft (90 m)
	VDC 20 AWG (0.5 mm^2)	500 ft (150 m)
	VDC 18 AWG (0.8 mm^2)	1000 ft (300 m)
	RS-485 22 AWG (0.35 mm^2) or larger	1000 ft (300 m)

1.2 Outputs option identification

You must know your transmitter's output option to correctly install the transmitter.

The transmitter's model number is on a tag on the side of the transmitter. You can use the model number to determine the transmitter's output option. The first four characters are the transmitter type. The fifth character is the installation type. The eighth character is the output option. See) L J X U, H 7 D E O, and 7 D E O. The remaining characters are not relevant to transmitter installation.

Figure 1-7: Model code identification

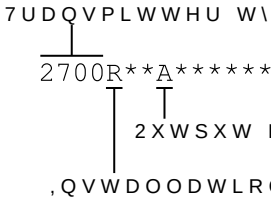


Table 1-2: Installation types

Letter	Description
R	Remote mount 4-wire
I	Integral
C	Remote mount 9-wire (painted aluminum housing)
B	Remote core processor with remote transmitter
M	Remote mount 4-wire (stainless steel housing)
P	Remote mount 9-wire (stainless steel housing)

Table 1-3: Output options

Letter	Description
A	Analog outputs – one mA, one frequency, one RS-485
B	Configurable input/outputs – default configuration of two mA, one frequency
C	Configurable input/outputs – custom configuration
D	Intrinsically safe analog outputs

1.3 Environmental limits

The transmitter's environmental limits include temperature, humidity, and vibration.

Table 1-4: Environmental limits

Type	Range
Ambient temperature limits	–40 to +140 °F (–40 to +60 °C)

Table 1-4: Environmental limits F R Q W L Q X H G

Type	Range
Humidity limits	5 to 95% relative humidity, non-condensing at 140 °F (60 °C)
Vibration limits	Meets IEC68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0 g
EMI effects	Complies with EMC Directive 2004/108/EC per EN 61326 Industrial Complies with NAMUR NE-21 (22.08.2007)
Ambient temperature effect on analog outputs	On mA output: ±0.005% of span per °C

If possible, install the transmitter in a location that will prevent direct exposure to sunlight. The environmental limits for the transmitter may be further restricted by hazardous area approvals.

1.4 Hazardous area classifications

If you plan to mount the transmitter in a hazardous area:

- Verify that the transmitter has the appropriate hazardous area approval. Each transmitter has a hazardous area approval tag attached to the transmitter housing.
- Ensure that any cable used between the transmitter and the sensor meets the hazardous area requirements.

1.5 Power requirements

Self-switching AC/DC input, automatically recognizes supply voltage

- 85 to 265 VAC, 50/60 Hz, 6 watts typical, 11 watts maximum
- 18 to 100 VDC, 6 watts typical, 11 watts maximum
- Complies with low voltage directive 2006/95/EC per EN 61010-1 (IEC 61010-1) with amendment 2, and Installation (Overvoltage) Category II, Pollution Degree 2

Note

For DC power:

- Power requirements assume a single transmitter per cable.
- At startup, the power source must provide a minimum of 1.5 amps of short-term current per transmitter.
- Length and conductor diameter of the power cable must be sized to provide 18 VDC minimum at the power terminals, at a load current of 0.5 amps. See) L J X U and 7 D E O H for cable sizing guidelines.

Figure 1-8: Cable sizing formula

f 0 PLQLPXP VXSSO\ YROWDJH
f 5 FDEOH UHVLVWDQFH
f / FDEOH OHQJWK

Table 1-5: Typical power cable resistance at 68 °F (20 °C)

Wire gauge	Resistance
14 AWG	Ω/ft
16 AWG	Ω/ft
18 AWG	Ω/ft
20 AWG	Ω/ft
2.5 mm^2	Ω/m
1.5 mm^2	Ω/m
1.0 mm^2	Ω/m
0.75 mm^2	Ω/m
0.50 mm^2	Ω/m

1.6 Orientation

You can mount the transmitter in any orientation as long as the conduit openings do not point upward.

CAUTION!

Upward-facing conduit openings risk condensation moisture entering the transmitter housing, which could damage the transmitter.

1.7 Accessibility for maintenance

Mount the flowmeter in a location and orientation that satisfies the following conditions:

- Allows sufficient clearance to open the transmitter housing cover. Micro Motion recommends 8–10 inches (200–250 mm) clearance at the rear of the transmitter.
- Provides clear access for installing cabling to the transmitter.

2 Mounting and sensor wiring for integral installations

Topics covered in this chapter:

- 0RXQWLQJ DQG VHQVRU ZLULQJ
- 5RWDWH WKH WUDQVPLWWHU RQ WKH VHQVRU RSW
- 5RWDWH WKH XVHU LQWHUIDFH RQ WKH WUDQVPLWV
- *URXQG WKH WUDQVPLWWHU

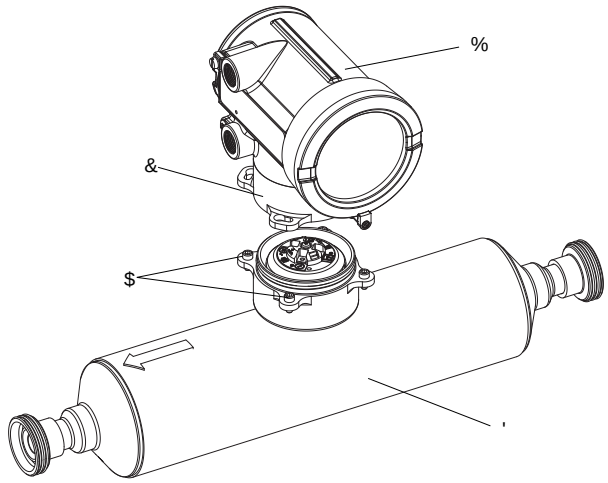
2.1 Mounting and sensor wiring

There are no separate mounting requirements for integral transmitters, and no need to connect wiring between the transmitter and the sensor.

2.2 Rotate the transmitter on the sensor (optional)

In integral installations, you can rotate the transmitter on the sensor up to 360º in 90º increments.

Figure 2-1: Components of an integral transmitter



$ &DS VFUHZV
% 7UDQVPLWWHU
& 7UDQVLWLRQ ULQJ
' 6HQVRU

Procedure

1. Loosen each of the four cap screws (4 mm) that fasten the transmitter to the base.
2. Rotate the transmitter counter-clockwise so that the cap screws are in the unlocked position.
3. Gently lift the transmitter straight up, disengaging it from the cap screws.

Important
Do not disconnect or damage the wires that connect the transmitter to the core processor.

4. Rotate the transmitter to the desired orientation.

Important
Do not pinch or stress the wires.

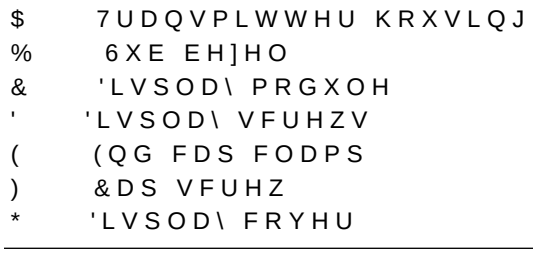
The slots on the transition ring should be aligned with the cap screws.

5. Gently lower the transmitter onto the base, inserting the cap screws into the slots.
6. Rotate the transmitter clockwise so that the cap screws are in the locked position.
7. Tighten the cap screws, torquing to 20 to 30 in-lbs (2.3 to 3.4 N-m).

2.3 Rotate the user interface on the transmitter (optional)

The user interface on the transmitter electronics module can be rotated 90º or 180° from the original position.

Figure 2-2: Display components



Procedure

1. Shut off power to the unit.
2. Remove the end-cap clamp by removing the cap screw.
3. Turn the display cover counterclockwise to remove it from the main enclosure.
4. Carefully loosen (and remove if necessary) the semicaptive display screws while holding the display module in place.
5. Carefully pull the display module out of the main enclosure until the sub-bezel pin terminals are disengaged from the display module.

   Note

   If the display pins come out of the board stack with the display module, remove the pins and reinstall them.

6. Rotate the display module to the desired position.
7. Insert the sub-bezel pin terminals into the display module pin holes to secure the display in its new position.
8. If you have removed the display screws, line them up with the matching holes on the sub-bezel, then reinsert and tighten them.

9. Place the display cover onto the main enclosure.
10. Turn the display cover clockwise until it is snug.
11. Replace the end-cap clamp by reinserting and tightening the cap screw.
12. Restore power to the transmitter.

2.4 Ground the transmitter

In an integral installation, all components are grounded together.

Prerequisites

If national standards are not in effect, adhere to the following guidelines for grounding:

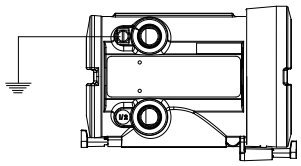
- Use copper wire, 14 AWG (2.5 mm^2) or larger wire size.
- Keep all ground leads as short as possible, less than 1 »impedance.
- Connect ground leads directly to earth, or follow plant standards.

Procedure

Ground via the piping, if possible (see sensor documentation). If grounding via the piping is not possible, ground according to applicable local standards using the transmitter's internal or external ground screw.

Figure 2-3: Transmitter internal grounding screw

Figure 2-4: Transmitter external grounding screw



3 Mounting and sensor wiring for 4-wire remote installations

Topics covered in this chapter:

- 0RXQWLQJ RSWLRQV
- 3UHSDUH WKH ZLUH FDEOH
- :LUH WKH WUDQVPLWWHU WR WKH VHQVRU
- 5RWDWH WKH XVHU LQWHUIDFH RQ WKH WUDQVPLWW
- *URXQG WKH WUDQVPLWWHU

3.1 Mounting options

There are two options available for mounting the transmitter:

- Mount the transmitter to a wall or flat surface.
- Mount the transmitter to an instrument pole.

3.1.1 Mount the transmitter to a wall

Prerequisites

- Use four 5/16-inch diameter (or M8) bolts and nuts that can withstand the process environment. Micro Motion does not supply bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure that the surface is flat and rigid, does not vibrate, or move excessively.

Procedure

1. If desired, re-orient the transmitter on the mounting bracket.
   a. Remove the junction end-cap from the junction housing.
   b. Loosen each of the four cap screws (4 mm).
   c. Rotate the bracket so that the transmitter is oriented as desired.
   d. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).
   e. Replace the junction end-cap.

Figure 3-1: Components of 4-wire remote mount transmitter (aluminum housing)

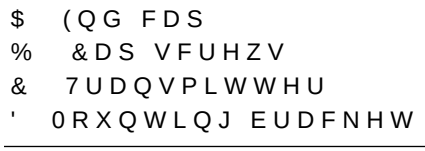
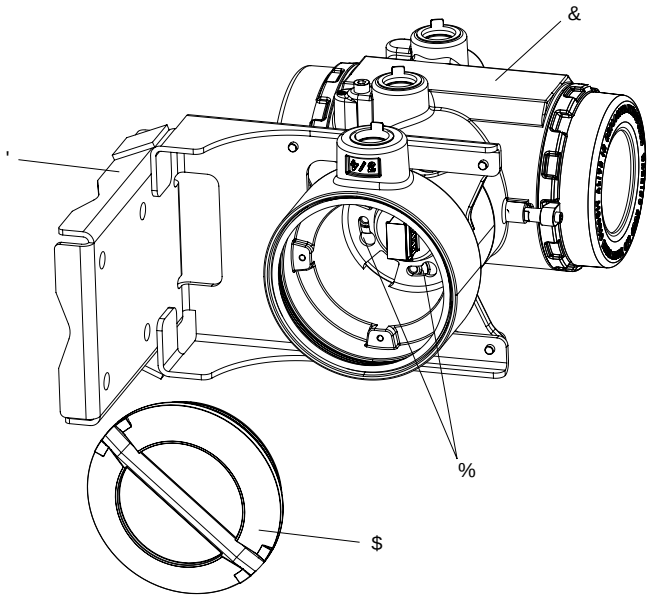


Figure 3-2: Components of a 4-wire remote mount transmitter (stainless steel housing)



$ (QG FDS
% &DS VFUHZV
& 7UDQVPLWWHU
' 0RXQWLQJ EUDFNHW

2. Attach the mounting bracket to the wall.

3.1.2 Mount the transmitter to an instrument pole

Prerequisites

- Use two 5/16-inch U-bolts for 2-inch pipe, and four matching nuts, that can withstand the process environment. Micro Motion does not supply U-bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure the instrument pole extends at least 12 inches (305 mm) from a rigid base, and is no more than 2 inches (50.8 mm) in diameter.

Procedure

1. If desired, re-orient the transmitter on the mounting bracket.
   a. Remove the junction end-cap from the junction housing.
   b. Loosen each of the four cap screws (4 mm).
   c. Rotate the bracket so that the transmitter is oriented as desired.
   d. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).
   e. Replace the junction end-cap.

Figure 3-3: Components of 4-wire remote mount transmitter (aluminum housing)

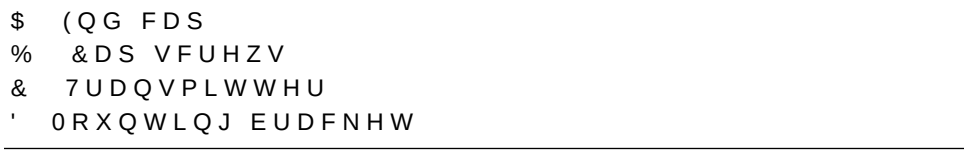
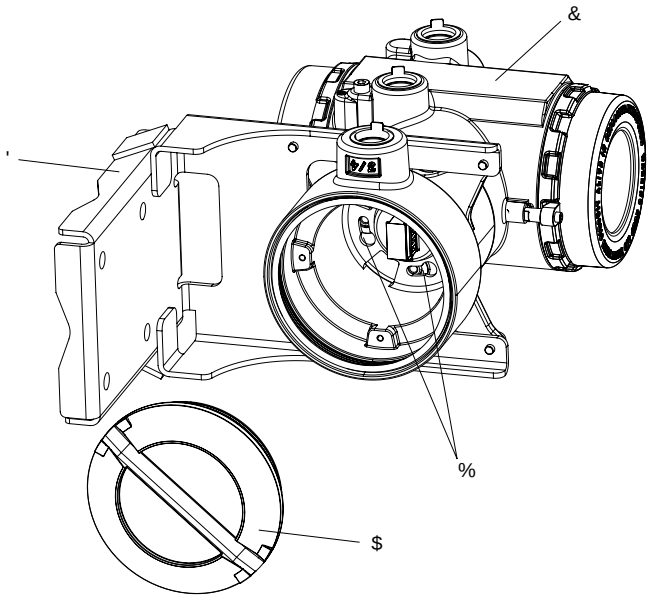


Figure 3-4: Components of a 4-wire remote mount transmitter (stainless steel housing)



$ (QG FDS
% &DS VFUHZV
& 7UDQVPLWWHU
' 0RXQWLQJ EUDFNHW

2. Attach the mounting bracket to an instrument pole.

3.2 Prepare the 4-wire cable

Important

For user-supplied cable glands, the gland must be capable of terminating the drain wires.

Note

If you are installing unshielded cable in continuous metallic conduit with 360º termination shielding, you only need to prepare the cable – you do not need to perform the shielding procedure.

Figure 3-5: 4-wire cable preparation

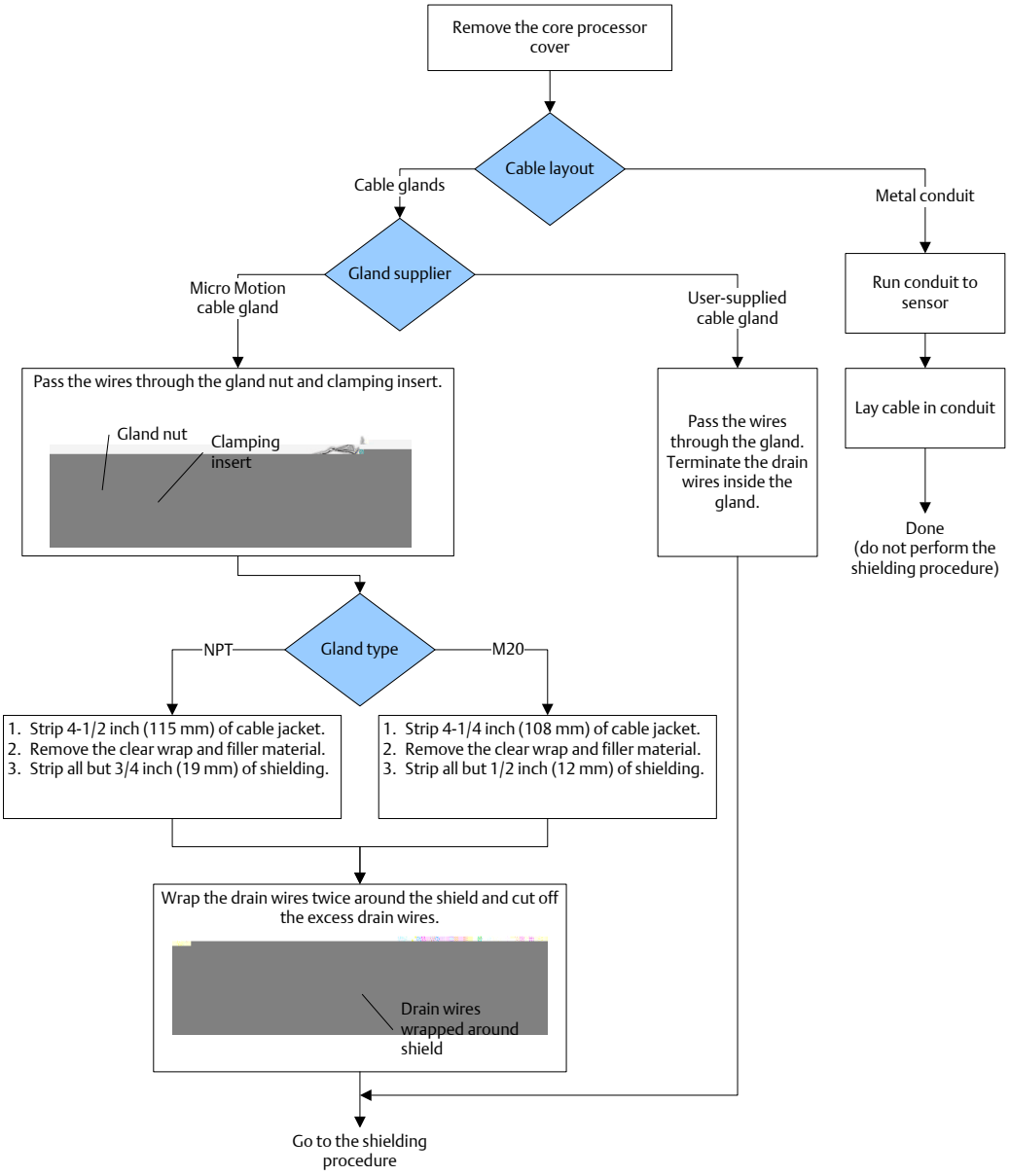
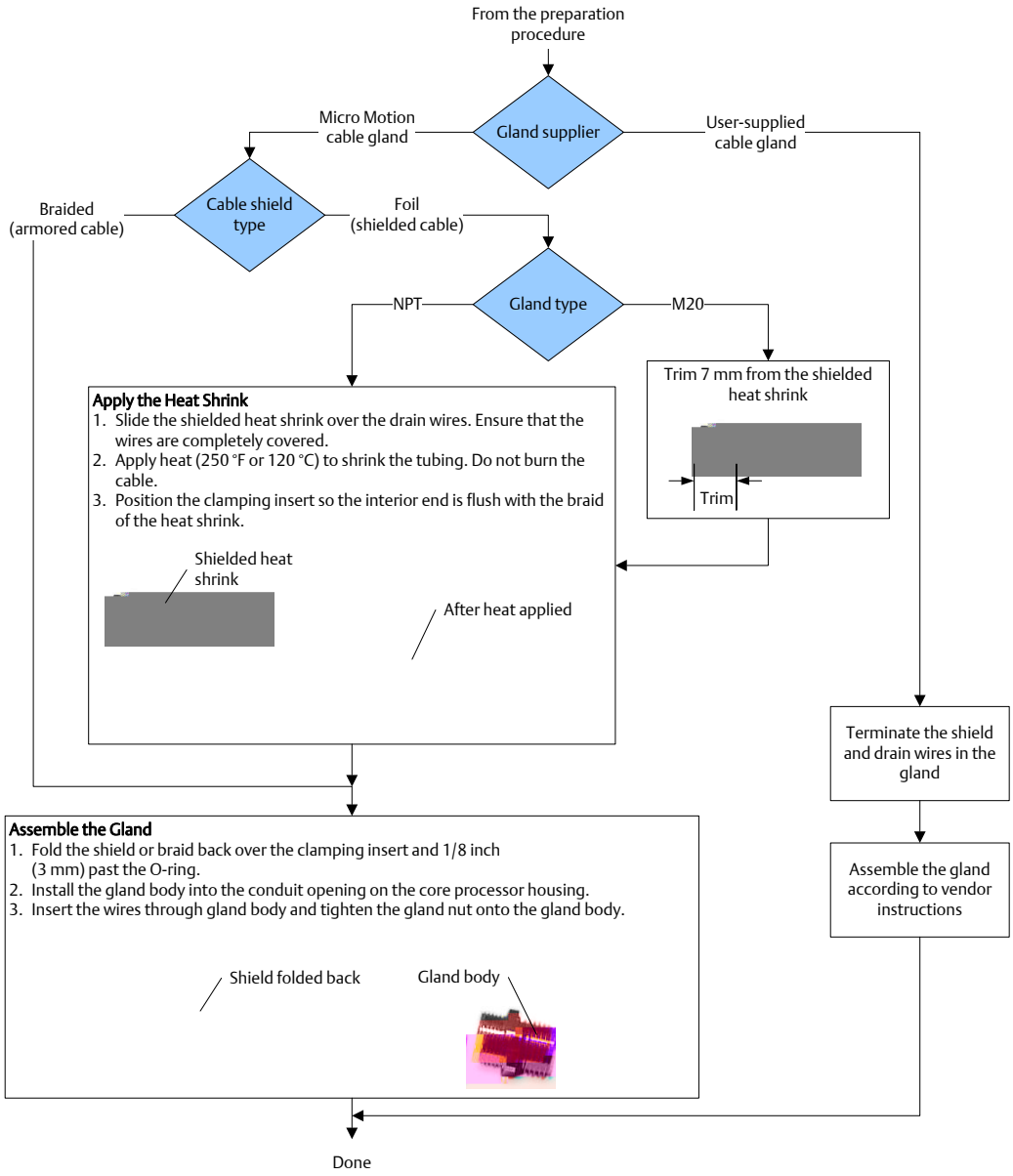

Remove the core processor cover
Cable layout
Cable glands
Metal conduit
Gland supplier
Micro Motion cable gland
User-supplied cable gland
Run conduit to sensor
Pass the wires through the gland nut and clamping insert.
Gland nut
Clamping insert
Pass the wires through the gland. Terminate the drain wires inside the gland.
Lay cable in conduit
Done (do not perform the shielding procedure)
Gland type
NPT
M20
1. Strip 4-1/2 inch (115 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Strip all but 3/4 inch (19 mm) of shielding.
1. Strip 4-1/4 inch (108 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Strip all but 1/2 inch (12 mm) of shielding.
Wrap the drain wires twice around the shield and cut off the excess drain wires.
Drain wires wrapped around shield
Go to the shielding procedure

Figure 3-6: 4-wire cable shielding


From the preparation procedure
Gland supplier
Micro Motion cable gland
User-supplied cable gland
Cable shield type
Braided (armored cable)
Foil (shielded cable)
Gland type
NPT
M20
Trim 7 mm from the shielded heat shrink
Trim
Apply the Heat Shrink
1. Slide the shielded heat shrink over the drain wires. Ensure that the wires are completely covered.
2. Apply heat (250 °F or 120 °C) to shrink the tubing. Do not burn the cable.
3. Position the clamping insert so the interior end is flush with the braid of the heat shrink.
Shielded heat shrink
After heat applied
Terminate the shield and drain wires in the gland
Assemble the Gland
1. Fold the shield or braid back over the clamping insert and 1/8 inch (3 mm) past the O-ring.
2. Install the gland body into the conduit opening on the core processor housing.
3. Insert the wires through gland body and tighten the gland nut onto the gland body.
Shield folded back
Gland body
Assemble the gland according to vendor instructions
Done

3.2.1 4-wire cable types and usage

Micro Motion offers two types of 4-wire cable: shielded and armored. Both types contain shield drain wires.

The 4-wire cable supplied by Micro Motion consists of one pair of red and black 18 AWG (0.75 mm^2) wires for the VDC connection, and one pair of white and green 22 AWG (0.35 mm^2) wires for the RS-485 connection.

User-supplied 4-wire cable must meet the following requirements:

- Twisted pair construction.
- Applicable hazardous area requirements, if the core processor is installed in a hazardous area.
- Wire gauge appropriate for the cable length between the core processor and the transmitter.

Table 3-1: Wire gauge

Wire gauge	Maximum cable length
VDC 22 AWG (0.35 mm^2)	300 ft (90 m)
VDC 20 AWG (0.5 mm^2)	500 ft (150 m)
VDC 18 AWG (0.8 mm^2)	1000 ft (300 m)
RS-485 22 AWG (0.35 mm^2) or larger	1000 ft (300 m)

3.3 Wire the transmitter to the sensor

1. Connect the cable to the core processor as described in the sensor documentation.
2. Feed the wires from the sensor through the conduit opening.
3. Connect wires to the appropriate terminals on the mating connector.

Important

Never ground the shield, braid, or drain wire(s) at the transmitter.

Tip

You may find it easier to unplug the mating connector to connect the wires. If you do so, remember to firmly reseat the mating connector and tighten the mating connector screws so that the mating connector cannot accidentally come loose.

Figure 3-7: Wiring path for transmitters with aluminum housing

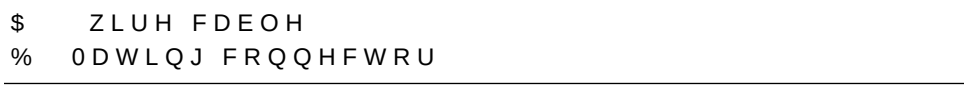
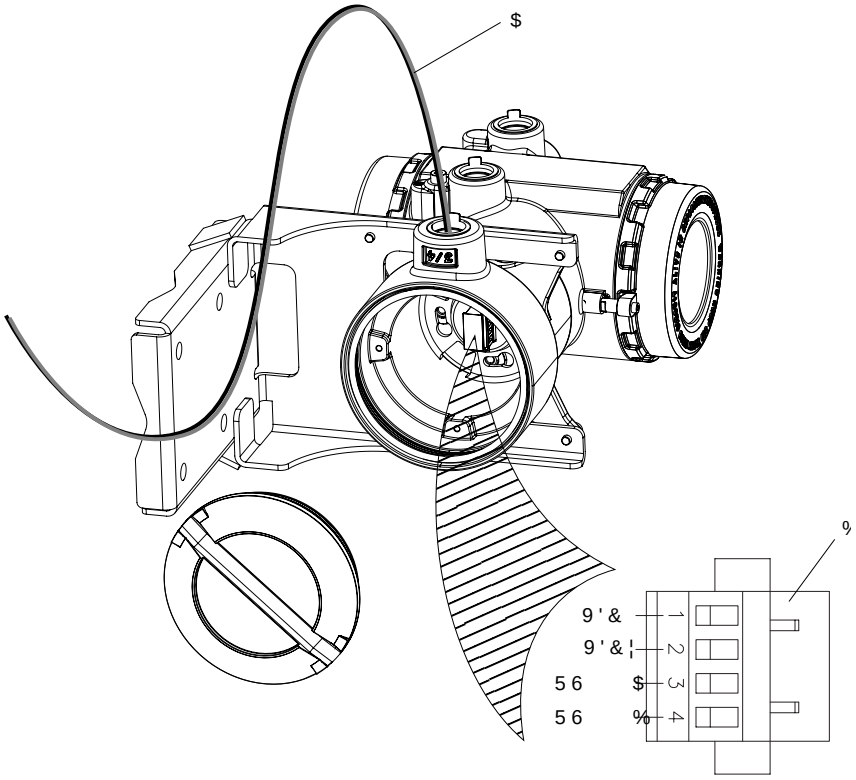


Figure 3-8: Wiring path for transmitters with stainless steel housing

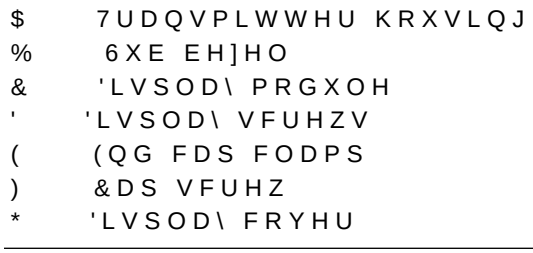


$ ZLUH FDEOH
% 0DWLQJ FRQQHFWRU

3.4 Rotate the user interface on the transmitter (optional)

The user interface on the transmitter electronics module can be rotated 90º or 180° from the original position.

Figure 3-9: Display components



Procedure

1. Shut off power to the unit.
2. Remove the end-cap clamp by removing the cap screw.
3. Turn the display cover counterclockwise to remove it from the main enclosure.
4. Carefully loosen (and remove if necessary) the semicaptive display screws while holding the display module in place.
5. Carefully pull the display module out of the main enclosure until the sub-bezel pin terminals are disengaged from the display module.

> **Note**
> If the display pins come out of the board stack with the display module, remove the pins and reinstall them.

6. Rotate the display module to the desired position.
7. Insert the sub-bezel pin terminals into the display module pin holes to secure the display in its new position.
8. If you have removed the display screws, line them up with the matching holes on the sub-bezel, then reinsert and tighten them.

9. Place the display cover onto the main enclosure.
10. Turn the display cover clockwise until it is snug.
11. Replace the end-cap clamp by reinserting and tightening the cap screw.
12. Restore power to the transmitter.

3.5 Ground the transmitter

In 4-wire remote installations, the transmitter and sensor are grounded separately.

Prerequisites

CAUTION!

Improper grounding could cause inaccurate measurements or flow meter failure. Failure to comply with requirements for intrinsic safety in a hazardous area could result in an explosion.

Note
For hazardous area installations in Europe, refer to standard EN 60079-14 or national standards.

If national standards are not in effect, adhere to the following guidelines for grounding:

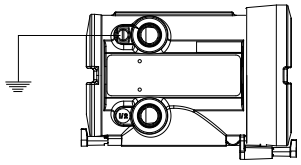
- Use copper wire, 14 AWG (2.5 mm^2) or larger wire size.
- Keep all ground leads as short as possible, less than 1 » impedance.
- Connect ground leads directly to earth, or follow plant standards.

Procedure

1. Ground the sensor according to the instructions in the sensor documentation.
2. Ground the transmitter according to applicable local standards, using the transmitter's internal or external ground screw.

Figure 3-10: Transmitter internal grounding screw

Figure 3-11: Transmitter external grounding screw



4 Mounting and sensor wiring for 9-wire remote installations

Topics covered in this chapter:

- 0RXQWLQJ RSWLRQV
- 3UHSDUH WKH ZLUH FDEOH
- :LUH WKH WUDQVPLWWHU WR WKH VHQVRU XVLQJ M
- :LUH WKH WUDQVPLWWHU WR WKH VHQVRU XVLQJ V
- 5RWDWH WKH XVHU LQWHUIDFH RQ WKH WUDQVPLW
- *URXQG WKH WUDQVPLWWHU

4.1 Mounting options

There are two options available for mounting the transmitter:

- Mount the transmitter to a wall or flat surface.
- Mount the transmitter to an instrument pole.

4.1.1 Mount the transmitter to a wall

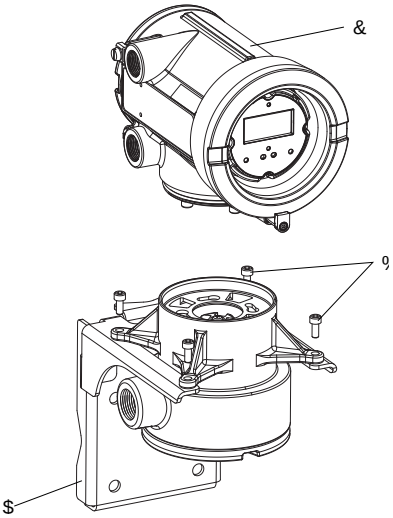
Prerequisites

- Use four 5/16-inch diameter (or M8) bolts and nuts that can withstand the process environment. Micro Motion does not supply bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure that the surface is flat and rigid, does not vibrate, or move excessively.

Procedure

1. If desired, re-orient the transmitter on the mounting bracket.
   a. Loosen each of the four cap screws (4 mm).
   b. Rotate the bracket so that the transmitter is oriented as desired.
   c. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).

Figure 4-1: Components of 9-wire remote mount transmitter



$ 0RXQWLQJ EUDFNHW
% &DS VFUHZV
& 7UDQVPLWWHU

2. Attach the mounting bracket to the wall.

4.1.2 Mount the transmitter to an instrument pole

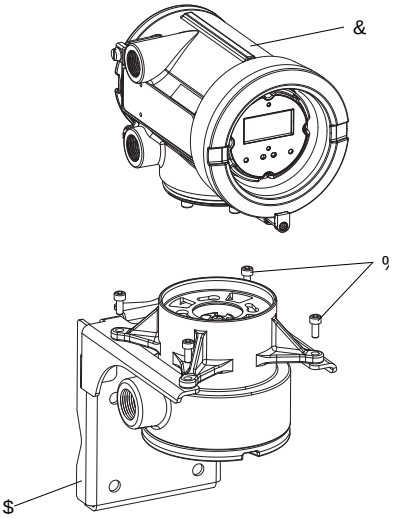
Prerequisites

- Use two 5/16-inch U-bolts for 2-inch pipe, and four matching nuts, that can withstand the process environment. Micro Motion does not supply U-bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure the instrument pole extends at least 12 inches (305 mm) from a rigid base, and is no more than 2 inches (50.8 mm) in diameter.

Procedure

1. If desired, re-orient the transmitter on the mounting bracket.
   a. Loosen each of the four cap screws (4 mm).
   b. Rotate the bracket so that the transmitter is oriented as desired.
   c. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).

Figure 4-2: Components of 9-wire remote mount transmitter



$ 0RXQWLQJ EUDFNHW
% &DS VFUHZV
& 7UDQVPLWWHU

2. Attach the mounting bracket to an instrument pole.

4.2 Prepare the 9-wire cable

Micro Motion supplies three types of 9-wire cable: jacketed, shielded, and armored. The type of cable you are using determines how you will prepare the cable.

Perform the cable preparation procedure appropriate for your cable type.

Figure 4-3: Preparing jacketed cable

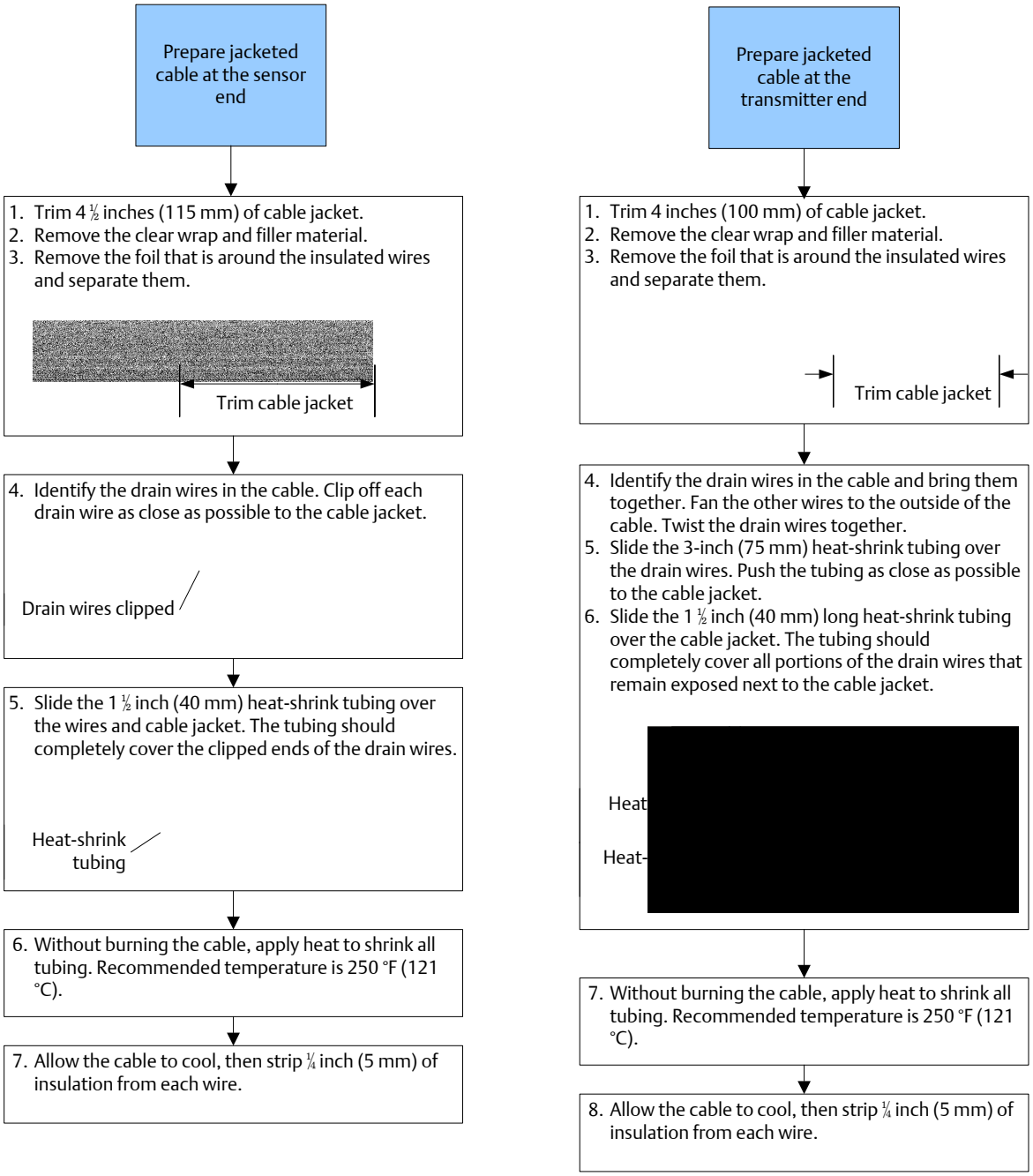
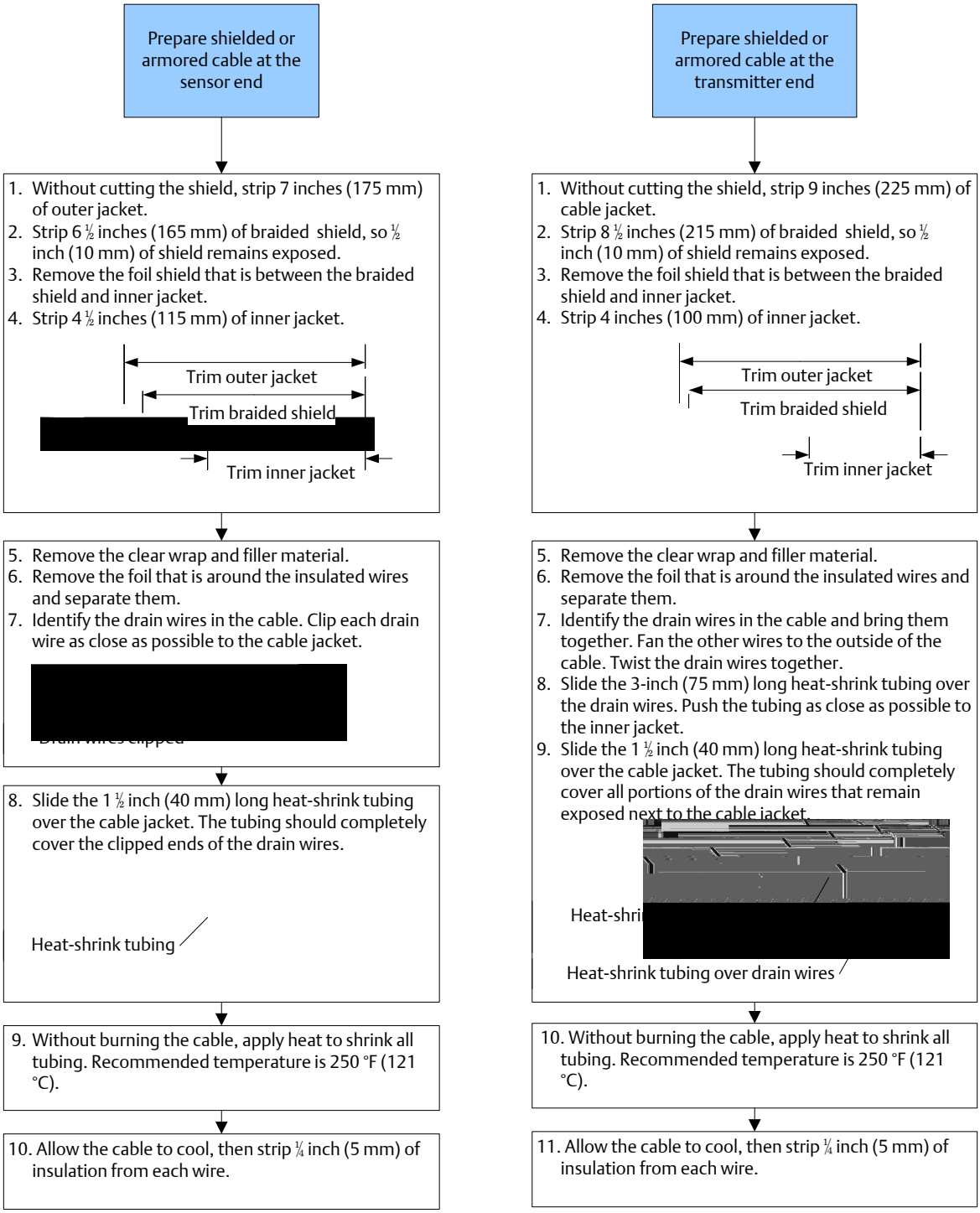

Prepare jacketed cable at the sensor end
1. Trim 4 ½ inches (115 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Remove the foil that is around the insulated wires and separate them.
Trim cable jacket
4. Identify the drain wires in the cable. Clip off each drain wire as close as possible to the cable jacket.
Drain wires clipped
5. Slide the 1 ½ inch (40 mm) heat-shrink tubing over the wires and cable jacket. The tubing should completely cover the clipped ends of the drain wires.
Heat-shrink tubing
6. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
7. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.
Prepare jacketed cable at the transmitter end
1. Trim 4 inches (100 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Remove the foil that is around the insulated wires and separate them.
Trim cable jacket
4. Identify the drain wires in the cable and bring them together. Fan the other wires to the outside of the cable. Twist the drain wires together.
5. Slide the 3-inch (75 mm) heat-shrink tubing over the drain wires. Push the tubing as close as possible to the cable jacket.
6. Slide the 1 ½ inch (40 mm) long heat-shrink tubing over the cable jacket. The tubing should completely cover all portions of the drain wires that remain exposed next to the cable jacket.
Heat
Heat-
7. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
8. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.

Figure 4-4: Preparing shielded or armored cable


Prepare shielded or armored cable at the sensor end
1. Without cutting the shield, strip 7 inches (175 mm) of outer jacket.
2. Strip 6 ½ inches (165 mm) of braided shield, so ½ inch (10 mm) of shield remains exposed.
3. Remove the foil shield that is between the braided shield and inner jacket.
4. Strip 4 ½ inches (115 mm) of inner jacket.
Trim outer jacket
Trim braided shield
Trim inner jacket
5. Remove the clear wrap and filler material.
6. Remove the foil that is around the insulated wires and separate them.
7. Identify the drain wires in the cable. Clip each drain wire as close as possible to the cable jacket.
8. Slide the 1 ½ inch (40 mm) long heat-shrink tubing over the cable jacket. The tubing should completely cover the clipped ends of the drain wires.
Heat-shrink tubing
9. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
10. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.
Prepare shielded or armored cable at the transmitter end
1. Without cutting the shield, strip 9 inches (225 mm) of cable jacket.
2. Strip 8 ½ inches (215 mm) of braided shield, so ½ inch (10 mm) of shield remains exposed.
3. Remove the foil shield that is between the braided shield and inner jacket.
4. Strip 4 inches (100 mm) of inner jacket.
Trim outer jacket
Trim braided shield
Trim inner jacket
5. Remove the clear wrap and filler material.
6. Remove the foil that is around the insulated wires and separate them.
7. Identify the drain wires in the cable and bring them together. Fan the other wires to the outside of the cable. Twist the drain wires together.
8. Slide the 3-inch (75 mm) long heat-shrink tubing over the drain wires. Push the tubing as close as possible to the inner jacket.
9. Slide the 1 ½ inch (40 mm) long heat-shrink tubing over the cable jacket. The tubing should completely cover all portions of the drain wires that remain exposed next to the cable jacket.
Heat-shri
Heat-shrink tubing over drain wires
10. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
11. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.

4.2.1 Micro Motion 9-wire cable types and usage

Cable types

Micro Motion supplies three types of 9-wire cable: jacketed, shielded, and armored. Note the following differences between the cable types:

- Armored cable provides mechanical protection for the cable wires.
- Jacketed cable has a smaller bend radius than shielded or armored cable.
- If ATEX compliance is required, the different cable types have different installation requirements.

Cable jacket types

All cable types can be ordered with a PVC jacket or Teflon® FEP jacket. Teflon FEP is required for the following installation types:

- All installations that include a T-series sensor.
- All installations with a cable length of 250 ft (75 m) or greater, a nominal flow less than 20 percent, and ambient temperature changes greater than +68 °F (+20 °C).

Table 4-1: Cable jacket material and temperature ranges

	Handling temperature		Operating temperature	
Cable jacket material	**Low limit**	**High limit**	**Low limit**	**High limit**
PVC	–4 °F (–20 °C)	+194 °F (+90 °C)	–40 °F (–40 °C)	+221 °F (+105 °C)
Teflon FEP	–40 °F (–40 °C)	+194 °F (+90 °C)	–76 °F (–60 °C)	+302 °F (+150 °C)

Cable bend radii

Table 4-2: Bend radii of jacketed cable

Jacket material	Outside diameter	Minimum bend radii	
		Static (no load) condition	Under dynamic load
PVC	0.415 inches (10 mm)	3–1/8 inches (80 mm)	6–1/4 inches (159 mm)
Teflon FEP	0.340 inches (9 mm)	2–5/8 inches (67 mm)	5–1/8 inches (131 mm)

Table 4-3: Bend radii of shielded cable

Jacket material	Outside diameter	Minimum bend radii	
		Static (no load) condition	Under dynamic load
PVC	0.2 inches (14 mm)	4–1/4 inches (108 mm)	8–1/2 inches (216 mm)
Teflon FEP	0.425 inches (11 mm)	3–1/4 inches (83 mm)	6–3/8 inches (162 mm)

Table 4-4: Bend radii of armored cable

Jacket material	Outside diameter	Minimum bend radii	
		Static (no load) condition	Under dynamic load
PVC	0.525 inches (14 mm)	4–1/4 inches (108 mm)	8–1/2 inches (216 mm)
Teflon FEP	0.340 inches (9 mm)	3–1/4 inches (83 mm)	6–3/8 inches (162 mm)

Cable illustrations

Figure 4-5: Cross-section view of jacketed cable

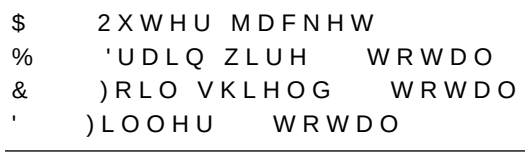


Figure 4-6: Cross-section view of shielded cable

$ 2XWHU MDFNHW
% 7LQ SODWHG FRSSHU EUDLGHG VKLHOG
&)RLO VKLHOG WRWDO
' ,QQHU MDFNHW
('UDLQ ZLUH WRWDO
))RLO VKLHOG WRWDO
*)LOOHU WRWDO

Figure 4-7: Cross-section view of armored cable

$ 2XWHU MDFNHW
% 6WDLQOHVV VWHHO EUDLGHG VKLHOG
&)RLO VKLHOG WRWDO
' ,QQHU MDFNHW
('UDLQ ZLUH WRWDO
))RLO VKLHOG WRWDO
*)LOOHU WRWDO

4.3 Wire the transmitter to the sensor using jacketed cable

Prerequisites

For ATEX installations, the jacketed cable must be installed inside a user-supplied sealed metallic conduit that provides 360° termination shielding for the enclosed cable.

CAUTION!

Sensor wiring is intrinsically safe. To keep sensor wiring intrinsically safe, keep the sensor wiring separated from power supply wiring and output wiring.

CAUTION!

Keep cable away from devices such as transformers, motors, and power lines, which produce large magnetic fields. Improper installation of cable, cable gland, or conduit could cause inaccurate measurements or flow meter failure.

CAUTION!

Improperly sealed housings can expose electronics to moisture, which can cause measurement error or flowmeter failure. Install drip legs in conduit and cable, if necessary. Inspect and grease all gaskets and O-rings. Fully close and tighten all housing covers and conduit openings.

Procedure

1. Run the cable through the conduit. Do not install 9-wire cable and power cable in the same conduit.
2. To prevent conduit connectors from seizing in the threads of the conduit openings, apply a conductive anti-galling compound to the threads, or wrap threads with PTFE tape two to three layers deep.

   Wrap the tape in the opposite direction that the male threads will turn when inserted into the female conduit opening.
3. Remove the junction box cover and core processor end-cap.
4. At both the sensor and transmitter, do the following:

   a. Connect a male conduit connector and waterproof seal to the conduit opening for 9-wire.

   b. Pass the cable through the conduit opening for the 9-wire cable.

   c. Insert the stripped end of each wire into the corresponding terminal at the sensor and transmitter ends, matching by color (see 7 D E O)H No bare wires should remain exposed.

Note

For ELITE®, H-Series, T-Series, and some F-Series sensors, match the wire to the terminal by the color identified on the inside of the sensor junction box cover.

Table 4-5: Sensor and transmitter terminal designations

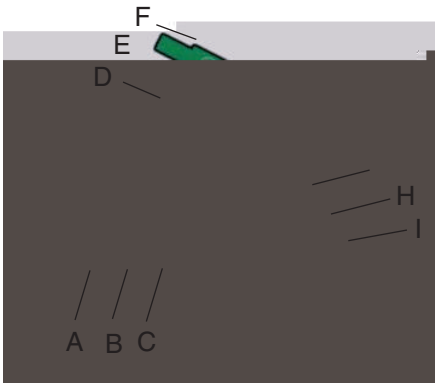
Wire color	Sensor terminal	Transmitter terminal	Function
Black	No connection	0	Drain wires
Brown	1	1	Drive +
Red	2	2	Drive –
Orange	3	3	Temperature –
Yellow	4	4	Temperature return
Green	5	5	Left pickoff +
Blue	6	6	Right pickoff +
Violet	7	7	Temperature +
Gray	8	8	Right pickoff –
White	9	9	Left pickoff –

d. Tighten the screws to hold the wire in place.

e. Ensure integrity of gaskets, grease all O-rings, then replace the junction box and transmitter housing covers and tighten all screws, as required.

4.3.1 Sensor and transmitter terminals

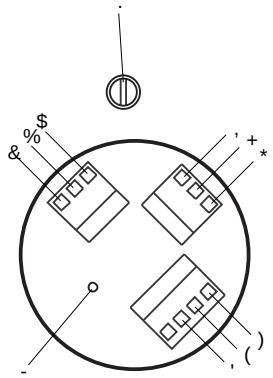
Figure 4-8: ELITE, H-Series, T-Series, and some F-Series sensor terminals



$ 9 L R O H W
% < H O O R Z
& 2 U D Q J H
' % U R Z Q
(: K L W H
) * U H H Q
* 5 H G
+ * U D \
, % O X H

Figure 4-9: F-Series, Model D, and Model DL sensor terminals

Figure 4-10: Model 2700 transmitter terminals



$ %URZQ
% 9LROHW
& <HOORZ
' 2UDQJH
(*UD\
) %OXH
* :KLWH
+ *UHHQ
, 5HG
- 0RXQWLQJ VFUHZ
. *URXQG VFUHZ EODFN

4.4 Wire the transmitter to the sensor using shielded or armored cable

Prerequisites

For ATEX installations, shielded or armored cable must be installed with cable glands, at both the sensor and transmitter ends. Cable glands that meet ATEX requirements can be purchased from Micro Motion. Cable glands from other vendors can be used.

CAUTION!

Keep cable away from devices such as transformers, motors, and power lines, which produce large magnetic fields. Improper installation of cable, cable gland, or conduit could cause inaccurate measurements or flow meter failure.

CAUTION!

Install cable glands in the 9-wire conduit opening in the transmitter housing and the sensor junction box. Ensure that the cable drain wires and shields do not make contact with the junction box or the transmitter housing. Improper installation of cable or cable glands could cause inaccurate measurements or flow meter failure.

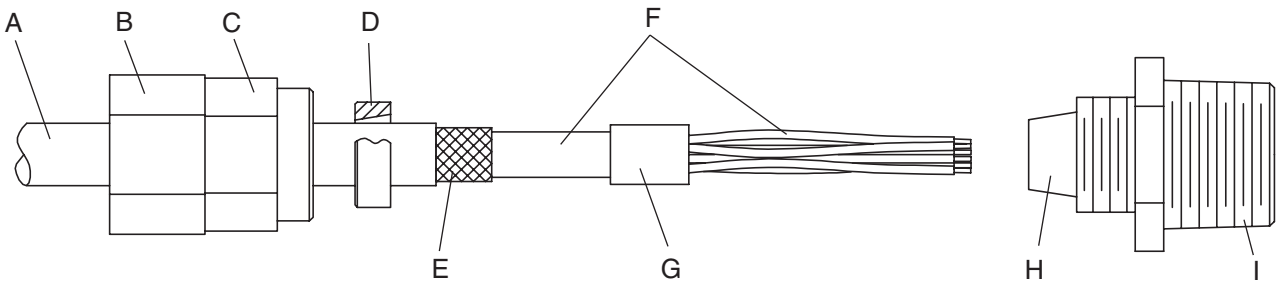
CAUTION!

Improperly sealed housings can expose electronics to moisture, which can cause measurement error or flowmeter failure. Install drip legs in conduit and cable, if necessary. Inspect and grease all gaskets and O-rings. Fully close and tighten all housing covers and conduit openings.

Procedure

1. Identify the components of the cable gland and cable (see) L J X U H).

Figure 4-11: Cable gland and cable (exploded view)

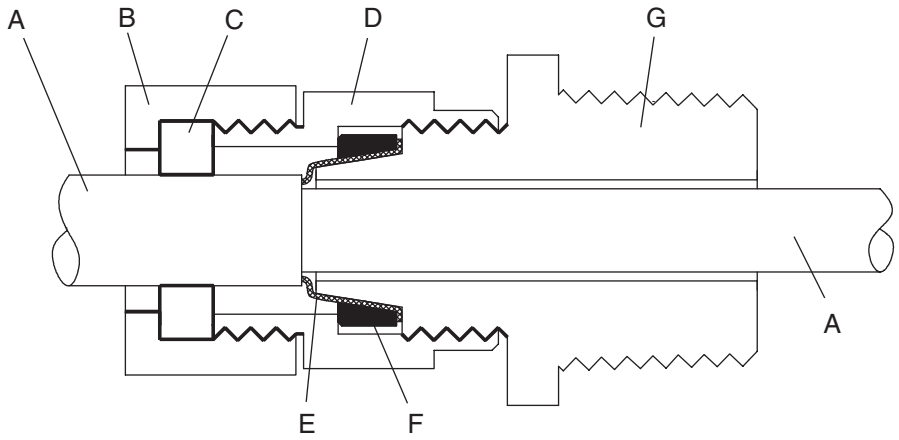


$ &DEOH
% 6HDOLQJ QXW
& &RPSUHVVLRQ QXW
' %UDVV FRPSUHVVLRQ ULQJ
(%UDLGHG VKLHOG
) &DEOH
* 7DSH RU KHDW VKULQN WXELQJ
+ &ODPS VHDW VKRZQ DV LQWHJUDO WR QLSSOH
, 1LSSOH

2. Unscrew the nipple from the compression nut.
3. Screw the nipple into the conduit opening for the 9-wire cable. Tighten it to one turn past hand-tight.
4. Slide the compression ring, compression nut, and sealing nut onto the cable. Make sure the compression ring is oriented so the taper will mate properly with the tapered end of the nipple.
5. Pass the cable end through the nipple so the braided shield slides over the tapered end of the nipple.
6. Slide the compression ring over the braided shield.
7. Screw the compression nut onto the nipple. Tighten the sealing nut and compression nut by hand to ensure that the compression ring traps the braided shield.

8. Use a 25-mm (1-inch) wrench to tighten the sealing nut and compression nut to 20–25 foot-pounds (27–34 N-m) of torque. See) L J X U H for an illustration of a complete cable gland assembly.

Figure 4-12: Cross-section of assembled cable gland with cable



$ &DEOH
% 6HDOLQJ QXW
& 6HDO
' &RPSUHVVLRQ QXW
(%UDLGHG VKLHOG
) %UDVV FRPSUHVVLRQ ULQJ
* 1LSSOH

9. Remove the junction box cover and core processor end-cap.
10. At both the sensor and transmitter, connect the cable according to the following procedure:

    a. Insert the stripped end of each wire into the corresponding terminal at the sensor and transmitter ends, matching by color (see 7 D E O) H No bare wires should remain exposed.

Note

For ELITE®, H-Series, T-Series, and some F-Series sensors, match the wire to the terminal by the color identified on the inside of the sensor junction box cover.

Table 4-6: Sensor and transmitter terminal designations

Wire color	Sensor terminal	Transmitter terminal	Function
Black	No connection	0	Drain wires
Brown	1	1	Drive +
Red	2	2	Drive –
Orange	3	3	Temperature –
Yellow	4	4	Temperature return

Table 4-6: Sensor and transmitter terminal designations F R Q W L Q X H G

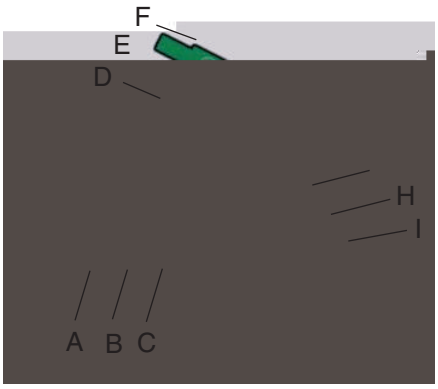
Wire color	Sensor terminal	Transmitter terminal	Function
Green	5	5	Left pickoff +
Blue	6	6	Right pickoff +
Violet	7	7	Temperature +
Gray	8	8	Right pickoff –
White	9	9	Left pickoff –

b. Tighten the screws to hold the wires in place.

c. Ensure integrity of gaskets, grease all O-rings, then replace the junction box and transmitter housing covers and tighten all screws, as required.

4.4.1 Sensor and transmitter terminals

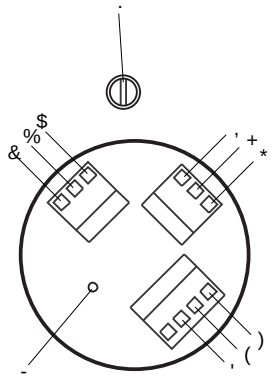
Figure 4-13: ELITE, H-Series, T-Series, and some F-Series sensor terminals



$ 9 L R O H W
% < H O O R Z
& 2 U D Q J H
' % U R Z Q
(: K L W H
) * U H H Q
* 5 H G
+ * U D \
, % O X H

Figure 4-14: F-Series, Model D, and Model DL sensor terminals

Figure 4-15: Model 2700 transmitter terminals

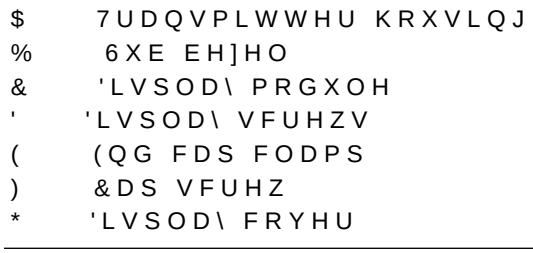


$ %URZQ
% 9LROHW
& <HOORZ
' 2UDQJH
(*UD\
) %OXH
* :KLWH
+ *UHHQ
, 5HG
- 0RXQWLQJ VFUHZ
. *URXQG VFUHZ EODFN

4.5 Rotate the user interface on the transmitter (optional)

The user interface on the transmitter electronics module can be rotated 90º or 180° from the original position.

Figure 4-16: Display components



Procedure

1. Shut off power to the unit.
2. Remove the end-cap clamp by removing the cap screw.
3. Turn the display cover counterclockwise to remove it from the main enclosure.
4. Carefully loosen (and remove if necessary) the semicaptive display screws while holding the display module in place.
5. Carefully pull the display module out of the main enclosure until the sub-bezel pin terminals are disengaged from the display module.

> **Note**
> If the display pins come out of the board stack with the display module, remove the pins and reinstall them.

6. Rotate the display module to the desired position.
7. Insert the sub-bezel pin terminals into the display module pin holes to secure the display in its new position.
8. If you have removed the display screws, line them up with the matching holes on the sub-bezel, then reinsert and tighten them.

9. Place the display cover onto the main enclosure.
10. Turn the display cover clockwise until it is snug.
11. Replace the end-cap clamp by reinserting and tightening the cap screw.
12. Restore power to the transmitter.

4.6 Ground the transmitter

In 9-wire remote installations, the transmitter/core processor assembly and sensor are grounded separately.

Prerequisites

CAUTION!

Improper grounding could cause inaccurate measurements or flow meter failure. Failure to comply with requirements for intrinsic safety in a hazardous area could result in an explosion.

Note

For hazardous area installations in Europe, refer to standard EN 60079-14 or national standards.

If national standards are not in effect, adhere to the following guidelines for grounding:

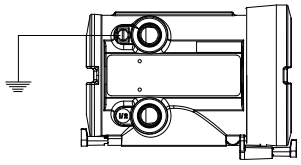
- Use copper wire, 14 AWG (2.5 mm^2) or larger wire size.
- Keep all ground leads as short as possible, less than 1 » impedance.
- Connect ground leads directly to earth, or follow plant standards.

Procedure

1. Ground the sensor according to the instructions in the sensor documentation.
2. Ground the transmitter/core processor assembly according to applicable local standards, using the transmitter's internal ground screw or the transmitter's external ground screw.

Figure 4-17: Transmitter internal ground screw

Figure 4-18: Transmitter external ground screw



5 Mounting and sensor wiring for remote core processor with remote sensor installations

Topics covered in this chapter:

- 0RXQWLQJ RSWLRQV
- 0RXQW WKH UHPRWH FRUH SURFHVVRU
- 3UHSDUH WKH ZLUH FDEOH
- :LUH WKH WUDQVPLWWHU WR WKH UHPRWH FRUH SU
- 3UHSDUH WKH ZLUH FDEOH
- :LUH WKH UHPRWH FRUH SURFHVVRU WR WKH VHQVR
- :LUH WKH UHPRWH FRUH SURFHVVRU WR WKH VHQVR
- 5RWDWH WKH XVHU LQWHUIDFH RQ WKH WUDQVPLWW
- *URXQG WKH WUDQVPLWWHU DQG UHPRWH FRUH SU

5.1 Mounting options

There are two options available for mounting the transmitter:

- Mount the transmitter to a wall or flat surface.
- Mount the transmitter to an instrument pole.

5.1.1 Mount the transmitter to a wall

Prerequisites

- Use four 5/16-inch diameter (or M8) bolts and nuts that can withstand the process environment. Micro Motion does not supply bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure that the surface is flat and rigid, does not vibrate, or move excessively.

Procedure

1. If desired, re-orient the transmitter on the mounting bracket.
   a. Remove the junction end-cap from the junction housing.
   b. Loosen each of the four cap screws (4 mm).

c. Rotate the bracket so that the transmitter is oriented as desired.
d. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).
e. Replace the junction end-cap.

Figure 5-1: Components of 4-wire remote mount transmitter (aluminum housing)

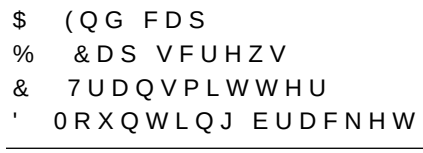
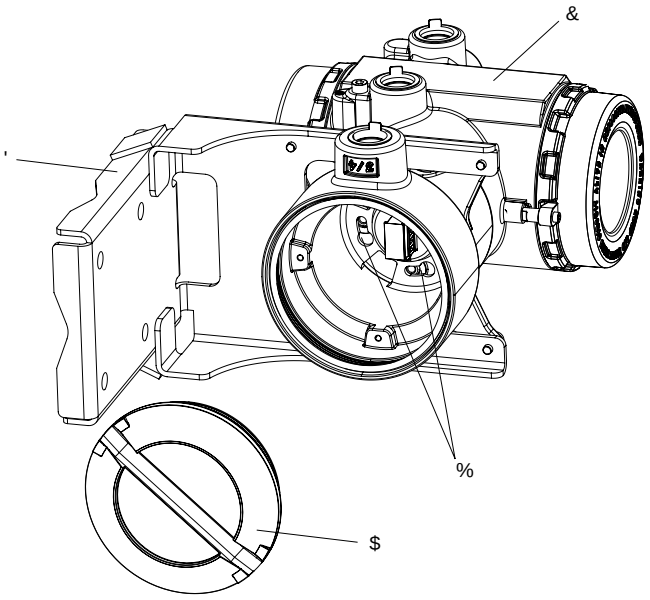


Figure 5-2: Components of a 4-wire remote mount transmitter (stainless steel housing)



$ (QG FDS
% &DS VFUHZV
& 7UDQVPLWWHU
' 0RXQWLQJ EUDFNHW

2. Attach the mounting bracket to the wall.

5.1.2 Mount the transmitter to an instrument pole

Prerequisites

- Use two 5/16-inch U-bolts for 2-inch pipe, and four matching nuts, that can withstand the process environment. Micro Motion does not supply U-bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure the instrument pole extends at least 12 inches (305 mm) from a rigid base, and is no more than 2 inches (50.8 mm) in diameter.

Procedure

1. If desired, re-orient the transmitter on the mounting bracket.
   a. Remove the junction end-cap from the junction housing.
   b. Loosen each of the four cap screws (4 mm).
   c. Rotate the bracket so that the transmitter is oriented as desired.
   d. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).
   e. Replace the junction end-cap.

Figure 5-3: Components of 4-wire remote mount transmitter (aluminum housing)

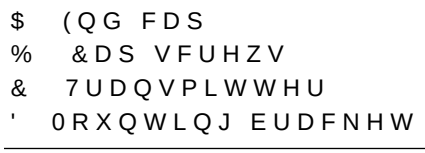
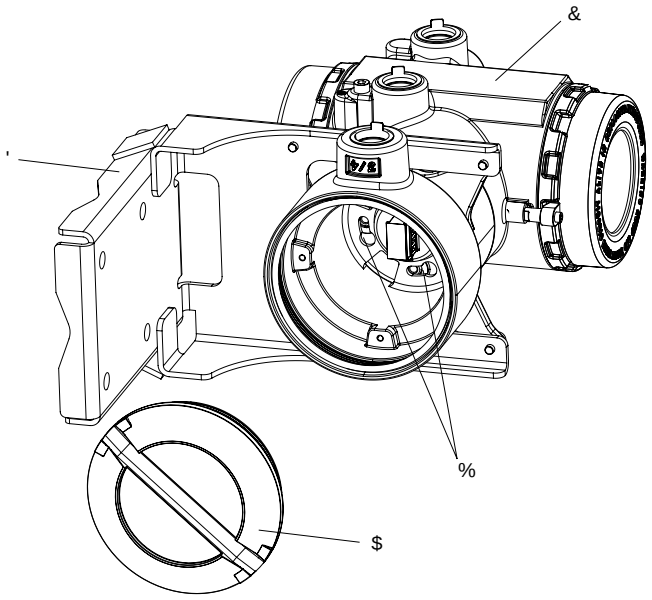


Figure 5-4: Components of a 4-wire remote mount transmitter (stainless steel housing)



$ (QG FDS
% &DS VFUHZV
& 7UDQVPLWWHU
' 0RXQWLQJ EUDFNHW

2. Attach the mounting bracket to an instrument pole.

5.2 Mount the remote core processor

This procedure is required only for remote core processor with remote transmitter installations.

Prerequisites

For mounting the remote core processor to a wall:

- Use four 5/16-inch diameter (or M8) bolts and nuts that can withstand the process environment. Micro Motion does not supply bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure that the surface is flat and rigid, does not vibrate, or move excessively.

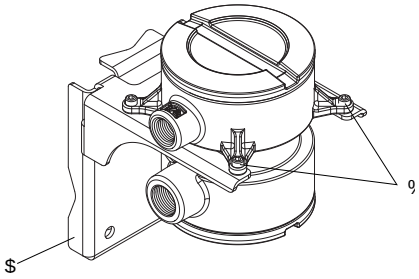
For mounting the remote core processor to an instrument pole:

- Use two 5/16-inch U-bolts for 2-inch pipe, and four matching nuts, that can withstand the process environment. Micro Motion does not supply U-bolts or nuts (appropriate bolts and nuts are available as an option).
- Ensure the instrument pole extends at least 12 inches (305 mm) from a rigid base, and is no more than 2 inches (50.8 mm) in diameter.

Procedure

1. If desired, reorient the core processor housing on the bracket.
   a. Loosen each of the four cap screws (4 mm).
   b. Rotate the bracket so that the core processor is oriented as desired.
   c. Tighten the cap screws, torquing to 30 to 38 in-lbs (3 to 4 N-m).

Figure 5-5: Components of a remote core processor



$ 0RXQWLQJ EUDFNHW
% &DS VFUHZV

2. Attach the mounting bracket to an instrument pole or wall.

5.3 Prepare the 4-wire cable

Important
For user-supplied cable glands, the gland must be capable of terminating the drain wires.

Note
If you are installing unshielded cable in continuous metallic conduit with 360º termination shielding, you only need to prepare the cable – you do not need to perform the shielding procedure.

Figure 5-6: 4-wire cable preparation

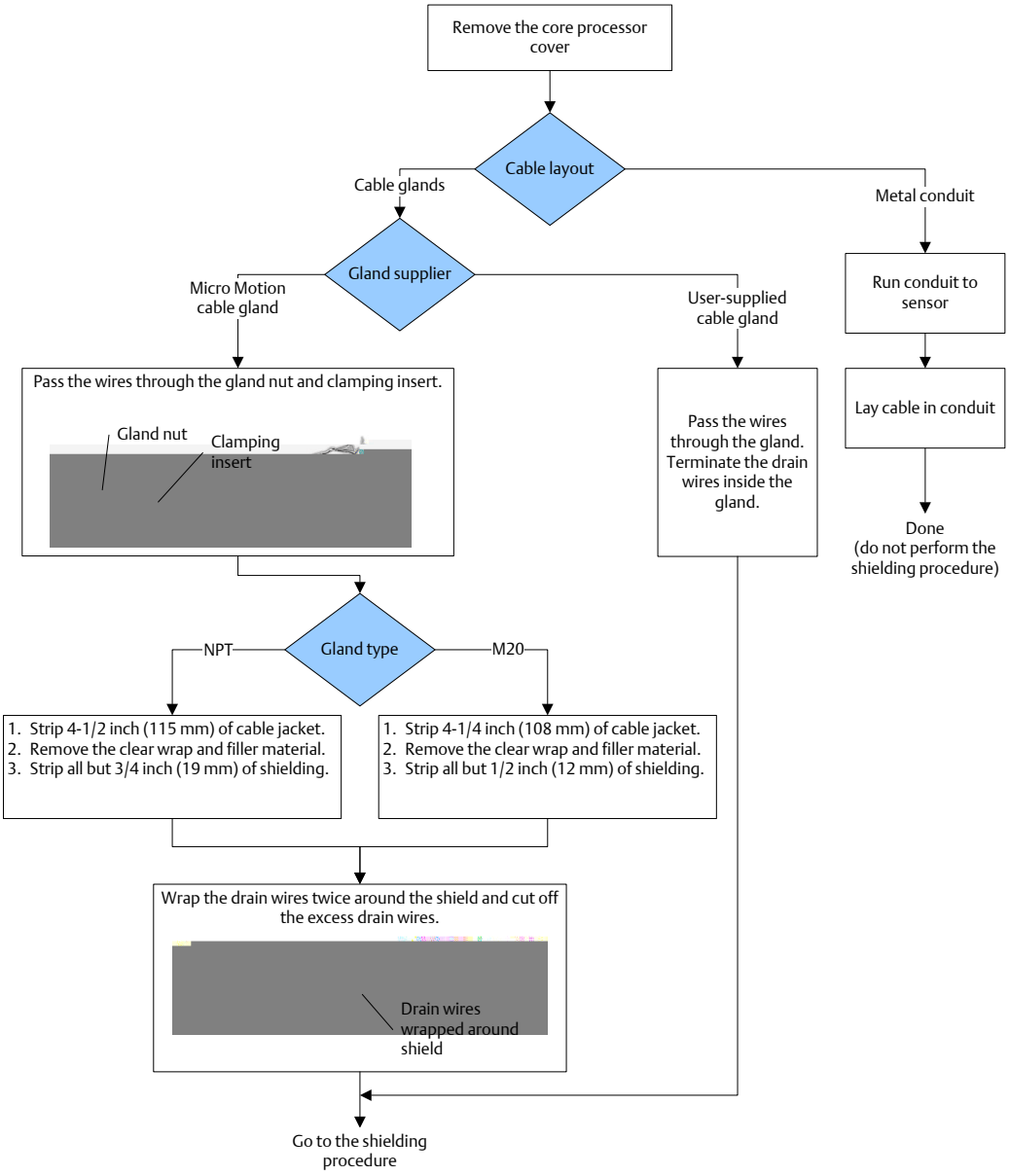
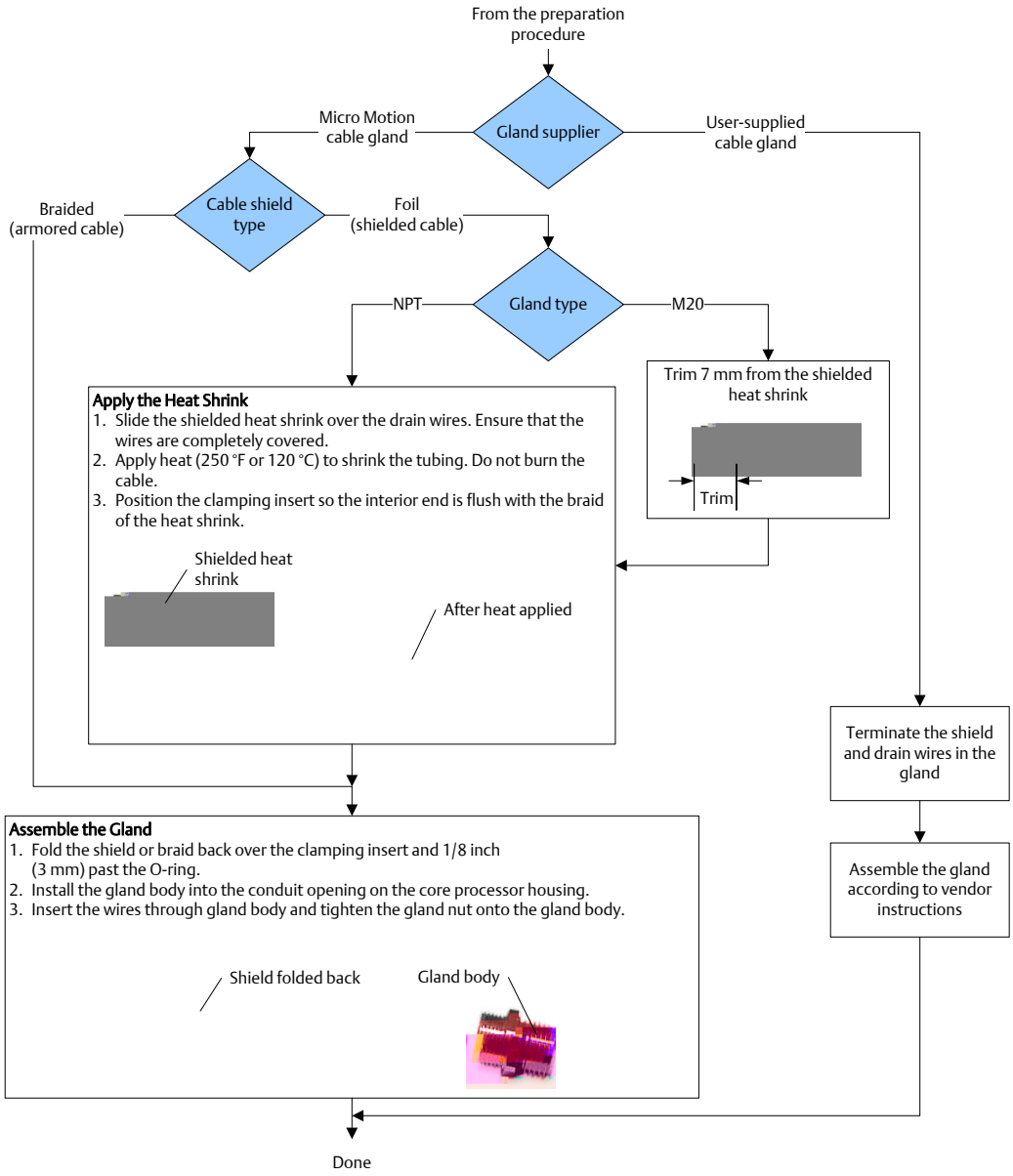

Remove the core processor cover
Cable layout
Cable glands
Metal conduit
Gland supplier
Micro Motion cable gland
User-supplied cable gland
Run conduit to sensor
Pass the wires through the gland nut and clamping insert.
Gland nut
Clamping insert
Pass the wires through the gland. Terminate the drain wires inside the gland.
Lay cable in conduit
Done (do not perform the shielding procedure)
Gland type
NPT
M20
1. Strip 4-1/2 inch (115 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Strip all but 3/4 inch (19 mm) of shielding.
1. Strip 4-1/4 inch (108 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Strip all but 1/2 inch (12 mm) of shielding.
Wrap the drain wires twice around the shield and cut off the excess drain wires.
Drain wires wrapped around shield
Go to the shielding procedure

Figure 5-7: 4-wire cable shielding


From the preparation procedure
Gland supplier
Micro Motion cable gland
User-supplied cable gland
Cable shield type
Braided (armored cable)
Foil (shielded cable)
Gland type
NPT
M20
Trim 7 mm from the shielded heat shrink
Trim
Apply the Heat Shrink
1. Slide the shielded heat shrink over the drain wires. Ensure that the wires are completely covered.
2. Apply heat (250 °F or 120 °C) to shrink the tubing. Do not burn the cable.
3. Position the clamping insert so the interior end is flush with the braid of the heat shrink.
Shielded heat shrink
After heat applied
Terminate the shield and drain wires in the gland
Assemble the Gland
1. Fold the shield or braid back over the clamping insert and 1/8 inch (3 mm) past the O-ring.
2. Install the gland body into the conduit opening on the core processor housing.
3. Insert the wires through gland body and tighten the gland nut onto the gland body.
Shield folded back
Gland body
Assemble the gland according to vendor instructions
Done

5.3.1 4-wire cable types and usage

Micro Motion offers two types of 4-wire cable: shielded and armored. Both types contain shield drain wires.

The 4-wire cable supplied by Micro Motion consists of one pair of red and black 18 AWG (0.75 mm^2) wires for the VDC connection, and one pair of white and green 22 AWG (0.35 mm^2) wires for the RS-485 connection.

User-supplied 4-wire cable must meet the following requirements:

- Twisted pair construction.
- Applicable hazardous area requirements, if the core processor is installed in a hazardous area.
- Wire gauge appropriate for the cable length between the core processor and the transmitter.

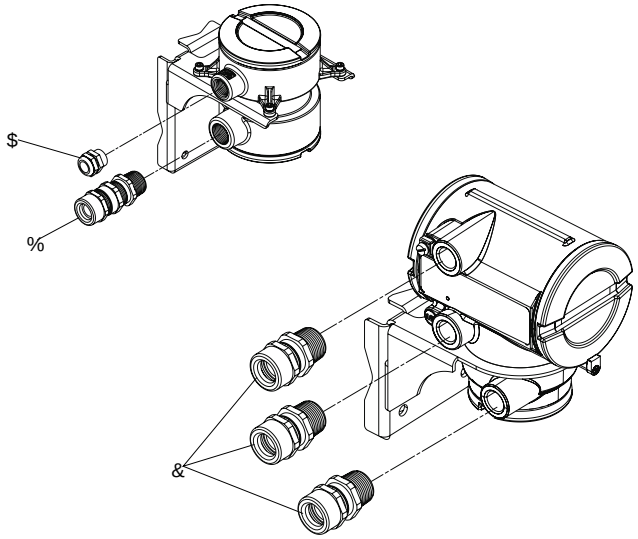
Table 5-1: Wire gauge

Wire gauge	Maximum cable length
VDC 22 AWG (0.35 mm^2)	300 ft (90 m)
VDC 20 AWG (0.5 mm^2)	500 ft (150 m)
VDC 18 AWG (0.8 mm^2)	1000 ft (300 m)
RS-485 22 AWG (0.35 mm^2) or larger	1000 ft (300 m)

5.4 Wire the transmitter to the remote core processor

1. If you are installing a Micro Motion-supplied cable gland at the core processor housing, identify the cable gland to use for the 4-wire cable conduit opening.

Figure 5-8: Cable gland identification



$ &DEOH JODQG XVHG ZLWK ZLUH FRQGXLW RSHQLQJ
% z 137 FDEOH JODQG XVHG ZLWK ZLUH FRQGXLW RSHQL
& z 137 RU 0 [FDEOH JODQGV XVHG ZLWK WUDQVPLWWH

2. Connect the cable to the core processor as described in the sensor documentation.
3. Feed the wires from the remote core processor through the conduit opening.

4. Connect wires to the appropriate terminals on the mating connector.

Important

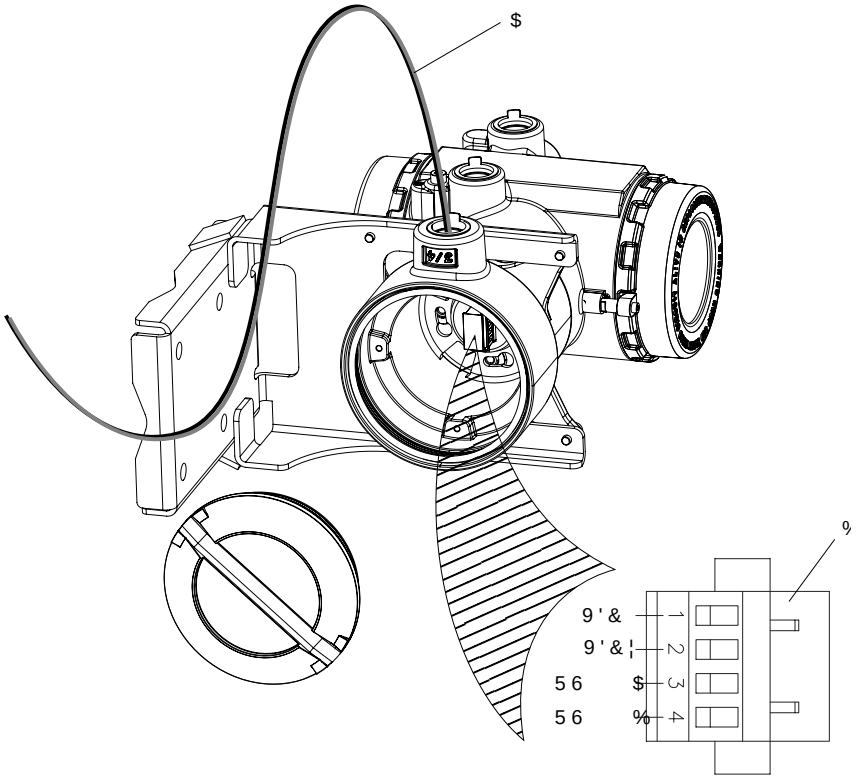
Never ground the shield, braid, or drain wire(s) at the transmitter.

Tip

You may find it easier to unplug the mating connector to connect the wires. If you do so, remember to firmly reseat the mating connector and tighten the mating connector screws so that the mating connector cannot accidentally come loose.

Figure 5-9: Wiring path for transmitters with aluminum housing

Figure 5-10: Wiring path for transmitters with stainless steel housing



$ ZLUH FDEOH
% 0DWLQJ FRQQHFWRU

5.5 Prepare the 9-wire cable

Micro Motion supplies three types of 9-wire cable: jacketed, shielded, and armored. The type of cable you are using determines how you will prepare the cable.

Perform the cable preparation procedure appropriate for your cable type.

Figure 5-11: Preparing jacketed cable

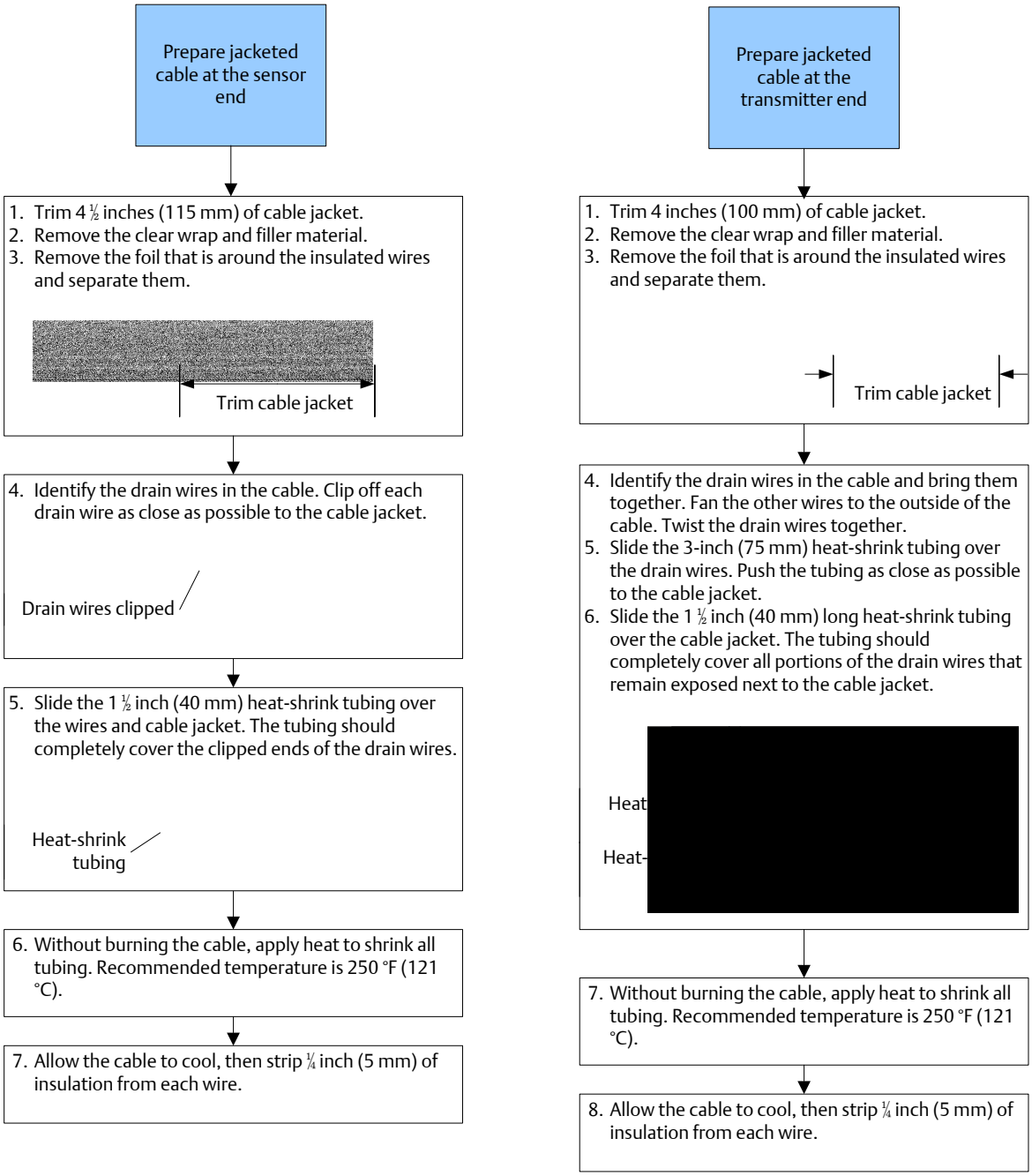
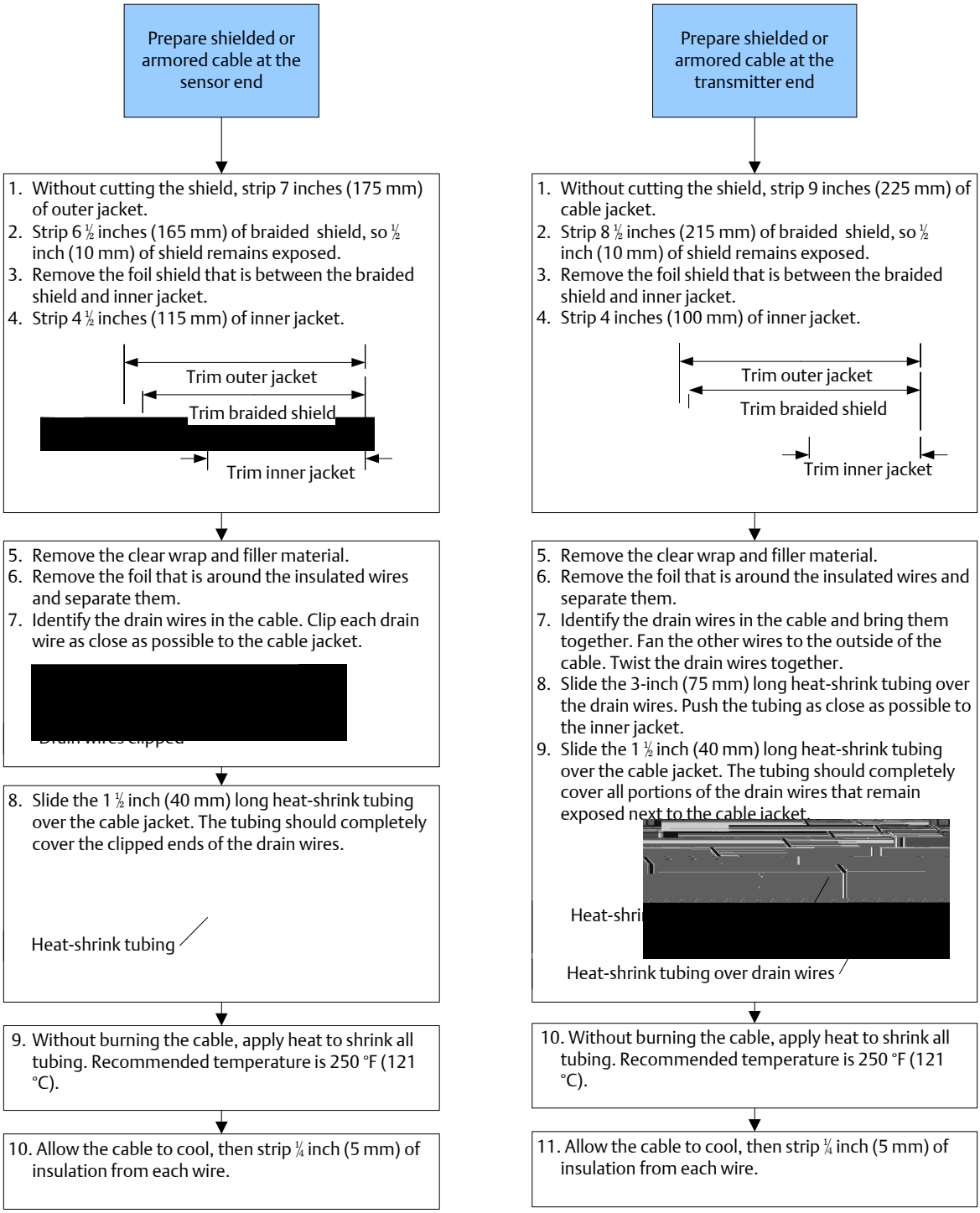

Prepare jacketed cable at the sensor end
1. Trim 4 ½ inches (115 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Remove the foil that is around the insulated wires and separate them.
Trim cable jacket
4. Identify the drain wires in the cable. Clip off each drain wire as close as possible to the cable jacket.
Drain wires clipped
5. Slide the 1 ½ inch (40 mm) heat-shrink tubing over the wires and cable jacket. The tubing should completely cover the clipped ends of the drain wires.
Heat-shrink tubing
6. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
7. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.
Prepare jacketed cable at the transmitter end
1. Trim 4 inches (100 mm) of cable jacket.
2. Remove the clear wrap and filler material.
3. Remove the foil that is around the insulated wires and separate them.
Trim cable jacket
4. Identify the drain wires in the cable and bring them together. Fan the other wires to the outside of the cable. Twist the drain wires together.
5. Slide the 3-inch (75 mm) heat-shrink tubing over the drain wires. Push the tubing as close as possible to the cable jacket.
6. Slide the 1 ½ inch (40 mm) long heat-shrink tubing over the cable jacket. The tubing should completely cover all portions of the drain wires that remain exposed next to the cable jacket.
Heat
Heat-
7. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
8. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.

Figure 5-12: Preparing shielded or armored cable


Prepare shielded or armored cable at the sensor end
1. Without cutting the shield, strip 7 inches (175 mm) of outer jacket.
2. Strip 6 ½ inches (165 mm) of braided shield, so ½ inch (10 mm) of shield remains exposed.
3. Remove the foil shield that is between the braided shield and inner jacket.
4. Strip 4 ½ inches (115 mm) of inner jacket.
Trim outer jacket
Trim braided shield
Trim inner jacket
5. Remove the clear wrap and filler material.
6. Remove the foil that is around the insulated wires and separate them.
7. Identify the drain wires in the cable. Clip each drain wire as close as possible to the cable jacket.
8. Slide the 1 ½ inch (40 mm) long heat-shrink tubing over the cable jacket. The tubing should completely cover the clipped ends of the drain wires.
Heat-shrink tubing
9. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
10. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.
Prepare shielded or armored cable at the transmitter end
1. Without cutting the shield, strip 9 inches (225 mm) of cable jacket.
2. Strip 8 ½ inches (215 mm) of braided shield, so ½ inch (10 mm) of shield remains exposed.
3. Remove the foil shield that is between the braided shield and inner jacket.
4. Strip 4 inches (100 mm) of inner jacket.
Trim outer jacket
Trim braided shield
Trim inner jacket
5. Remove the clear wrap and filler material.
6. Remove the foil that is around the insulated wires and separate them.
7. Identify the drain wires in the cable and bring them together. Fan the other wires to the outside of the cable. Twist the drain wires together.
8. Slide the 3-inch (75 mm) long heat-shrink tubing over the drain wires. Push the tubing as close as possible to the inner jacket.
9. Slide the 1 ½ inch (40 mm) long heat-shrink tubing over the cable jacket. The tubing should completely cover all portions of the drain wires that remain exposed next to the cable jacket.
Heat-shri
Heat-shrink tubing over drain wires
10. Without burning the cable, apply heat to shrink all tubing. Recommended temperature is 250 °F (121 °C).
11. Allow the cable to cool, then strip ¼ inch (5 mm) of insulation from each wire.

5.5.1 9-wire cable types and usage

Cable types

Micro Motion supplies three types of 9-wire cable: jacketed, shielded, and armored. Note the following differences between the cable types:

- Armored cable provides mechanical protection for the cable wires.
- Jacketed cable has a smaller bend radius than shielded or armored cable.
- If ATEX compliance is required, the different cable types have different installation requirements.

Cable jacket types

All cable types can be ordered with a PVC jacket or Teflon® FEP jacket. Teflon FEP is required for the following installation types:

- All installations that include a T-series sensor.
- All installations with a cable length of 250 ft (75 m) or greater, a nominal flow less than 20 percent, and ambient temperature changes greater than +68 °F (+20 °C).

Table 5-2: Cable jacket material and temperature ranges

	Handling temperature		Operating temperature	
Cable jacket material	**Low limit**	**High limit**	**Low limit**	**High limit**
PVC	–4 °F (–20 °C)	+194 °F (+90 °C)	–40 °F (–40 °C)	+221 °F (+105 °C)
Teflon FEP	–40 °F (–40 °C)	+194 °F (+90 °C)	–76 °F (–60 °C)	+302 °F (+150 °C)

Cable bend radii

Table 5-3: Bend radii of jacketed cable

Jacket material	Outside diameter	Minimum bend radii	
		Static (no load) condition	Under dynamic load
PVC	0.415 inches (10 mm)	3–1/8 inches (80 mm)	6–1/4 inches (159 mm)
Teflon FEP	0.340 inches (9 mm)	2–5/8 inches (67 mm)	5–1/8 inches (131 mm)

Table 5-4: Bend radii of shielded cable

Jacket material	Outside diameter	Minimum bend radii	
		Static (no load) condition	Under dynamic load
PVC	0.2 inches (14 mm)	4–1/4 inches (108 mm)	8–1/2 inches (216 mm)
Teflon FEP	0.425 inches (11 mm)	3–1/4 inches (83 mm)	6–3/8 inches (162 mm)

Table 5-5: Bend radii of armored cable

Jacket material	Outside diameter	Minimum bend radii	
		Static (no load) condition	Under dynamic load
PVC	0.525 inches (14 mm)	4–1/4 inches (108 mm)	8–1/2 inches (216 mm)
Teflon FEP	0.340 inches (9 mm)	3–1/4 inches (83 mm)	6–3/8 inches (162 mm)

Cable illustrations

Figure 5-13: Cross-section view of jacketed cable

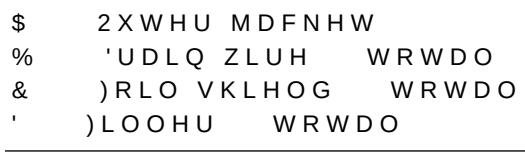


Figure 5-14: Cross-section view of shielded cable

$ 2XWHU MDFNHW
% 7LQ SODWHG FRSSHU EUDLGHG VKLHOG
&)RLO VKLHOG WRWDO
' ,QQHU MDFNHW
('UDLQ ZLUH WRWDO
))RLO VKLHOG WRWDO
*)LOOHU WRWDO

Figure 5-15: Cross-section view of armored cable

$ 2XWHU MDFNHW
% 6WDLQOHVV VWHHO EUDLGHG VKLHOG
&)RLO VKLHOG WRWDO
' ,QQHU MDFNHW
('UDLQ ZLUH WRWDO
))RLO VKLHOG WRWDO
*)LOOHU WRWDO

5.6 Wire the remote core processor to the sensor using jacketed cable

Prerequisites

For ATEX installations, the jacketed cable must be installed inside a user-supplied sealed metallic conduit that provides 360° termination shielding for the enclosed cable.

CAUTION!

Sensor wiring is intrinsically safe. To keep sensor wiring intrinsically safe, keep the sensor wiring separated from power supply wiring and output wiring.

CAUTION!

Keep cable away from devices such as transformers, motors, and power lines, which produce large magnetic fields. Improper installation of cable, cable gland, or conduit could cause inaccurate measurements or flow meter failure.

CAUTION!

Improperly sealed housings can expose electronics to moisture, which can cause measurement error or flowmeter failure. Install drip legs in conduit and cable, if necessary. Inspect and grease all gaskets and O-rings. Fully close and tighten all housing covers and conduit openings.

Procedure

1. Run the cable through the conduit. Do not install 9-wire cable and power cable in the same conduit.
2. To prevent conduit connectors from seizing in the threads of the conduit openings, apply a conductive anti-galling compound to the threads, or wrap threads with PTFE tape two to three layers deep.

   Wrap the tape in the opposite direction that the male threads will turn when inserted into the female conduit opening.
3. Remove the junction box cover and core processor end-cap.
4. At both the sensor and transmitter, do the following:

   a. Connect a male conduit connector and waterproof seal to the conduit opening for 9-wire.

   b. Pass the cable through the conduit opening for the 9-wire cable.

   c. Insert the stripped end of each wire into the corresponding terminal at the sensor and transmitter ends, matching by color. No bare wires should remain exposed.

Table 5-6: Sensor and remote core processor terminal designations

Wire color	Sensor terminal	Remote core processor terminal	Function
Black	No connection	Ground screw (see note)	Drain wires
Brown	1	1	Drive +
Red	2	2	Drive –
Orange	3	3	Temperature –
Yellow	4	4	Temperature return
Green	5	5	Left pickoff +
Blue	6	6	Right pickoff +
Violet	7	7	Temperature +
Gray	8	8	Right pickoff –
White	9	9	Left pickoff –

Note

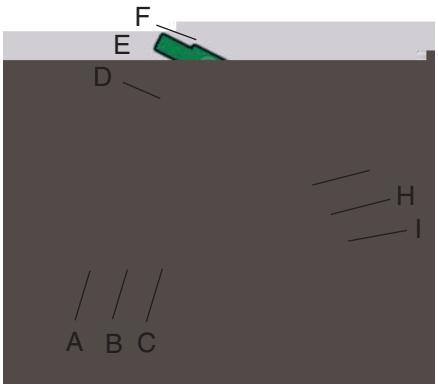
Ground the shield drain wires (the black wire) only on the core processor end, by connecting it to the ground screw inside the lower conduit ring. Never ground to the core processor's mounting screw. Never ground the cable at the sensor junction box.

d. Tighten the screws to hold the wire in place.

e. Ensure integrity of gaskets, grease all O-rings, then replace the junction-box and transmitter housing covers and tighten all screws, as required.

5.6.1 Sensor and remote core processor terminals

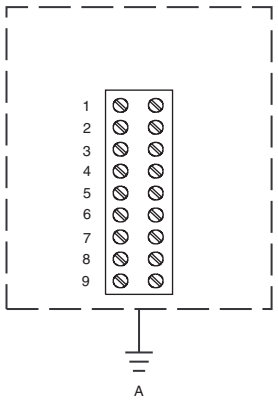
Figure 5-16: ELITE, H-Series, T-Series, and some F-Series sensor terminals



$ 9LROHW
% <HOORZ
& 2UDQJH
' %URZQ
(:KLWH
) *UHHQ
* 5HG
+ *UD\
, %OXH

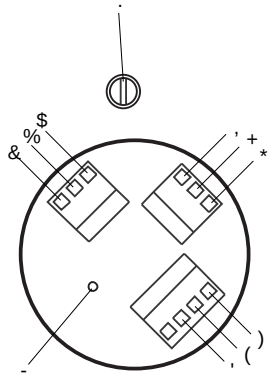
Figure 5-17: F-Series, Model D, and Model DL sensor terminals

Figure 5-18: Model DT sensor terminals (user-supplied metal junction box with terminal block)



$ (DUWK JURXQG

Figure 5-19: Remote core processor terminals



$ %URZQ
% 9LROHW
& <HOORZ
' 2UDQJH
(*UD\
) %OXH
* :KLWH
+ *UHHQ
, 5HG
- 0RXQWLQJ VFUHZ
. *URXQG VFUHZ EODFN

5.7 Wire the remote core processor to the sensor using shielded or armored cable

Prerequisites

For ATEX installations, shielded or armored cable must be installed with cable glands, at both the sensor and remote core processor ends. Cable glands that meet ATEX requirements can be purchased from Micro Motion. Cable glands from other vendors can be used.

CAUTION!

Keep cable away from devices such as transformers, motors, and power lines, which produce large magnetic fields. Improper installation of cable, cable gland, or conduit could cause inaccurate measurements or flow meter failure.

CAUTION!

Install cable glands in the 9-wire conduit opening in the transmitter housing and the sensor junction box. Ensure that the cable drain wires and shields do not make contact with the junction box or the transmitter housing. Improper installation of cable or cable glands could cause inaccurate measurements or flow meter failure.

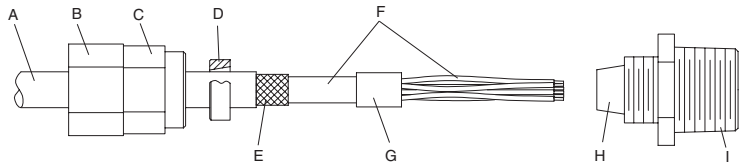
CAUTION!

Improperly sealed housings can expose electronics to moisture, which can cause measurement error or flowmeter failure. Install drip legs in conduit and cable, if necessary. Inspect and grease all gaskets and O-rings. Fully close and tighten all housing covers and conduit openings.

Procedure

1. Identify the components of the cable gland and cable.

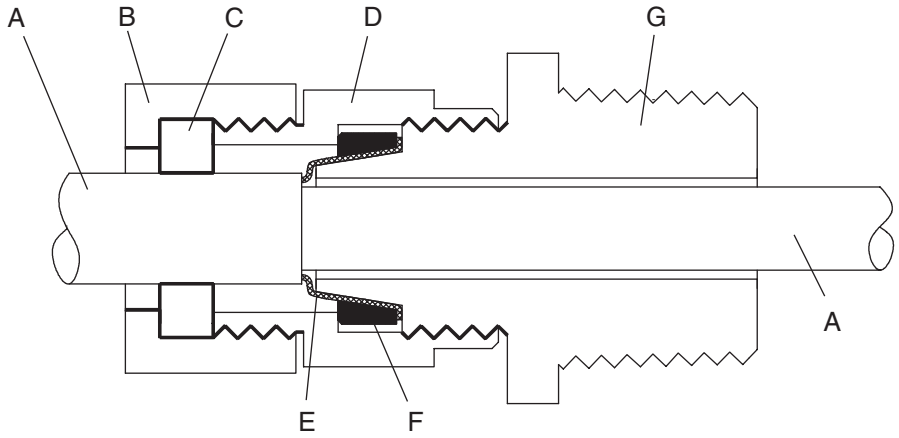
Figure 5-20: Cable gland and cable (exploded view)



$ &DEOH
% 6HDOLQJ QXW
& &RPSUHVVLRQ QXW
' %UDVV FRPSUHVVLRQ ULQJ
(%UDLGHG VKLHOG
) &DEOH
* 7DSH RU KHDW VKULQN WXELQJ
+ &ODPS VHDW VKRZQ DV LQWHJUDO WR QLSSOH
, 1LSSOH

2. Unscrew the nipple from the compression nut.
3. Screw the nipple into the conduit opening for the 9-wire cable. Tighten it to one turn past hand-tight.
4. Slide the compression ring, compression nut, and sealing nut onto the cable. Make sure the compression ring is oriented so the taper will mate properly with the tapered end of the nipple.
5. Pass the cable end through the nipple so the braided shield slides over the tapered end of the nipple.
6. Slide the compression ring over the braided shield.
7. Screw the compression nut onto the nipple. Tighten the sealing nut and compression nut by hand to ensure that the compression ring traps the braided shield.
8. Use a 25-mm (1-inch) wrench to tighten the sealing nut and compression nut to 20–25 foot-pounds (27–34 N-m) of torque.

Figure 5-21: Cross-section of assembled cable gland with cable



$ &DEOH
% 6HDOLQJ QXW
& 6HDO
' &RPSUHVVLRQ QXW
(%UDLGHG VKLHOG
) %UDVV FRPSUHVVLRQ ULQJ
* 1LSSOH

9. Remove the junction box cover and remote core processor end-cap.
10. At both the sensor and remote core processor, connect the cable according to the following procedure:

    a. Insert the stripped end of each wire into the corresponding terminal at the sensor and remote core processor ends, matching by color. No bare wires should remain exposed.

Table 5-7: Sensor and remote core processor terminal designations

Wire color	Sensor terminal	Remote core processor terminal	Function
Black	No connection	Ground screw (see notes)	Drain wires
Brown	1	1	Drive +
Red	2	2	Drive –
Orange	3	3	Temperature –
Yellow	4	4	Temperature return
Green	5	5	Left pickoff +
Blue	6	6	Right pickoff +
Violet	7	7	Temperature +
Gray	8	8	Right pickoff –
White	9	9	Left pickoff –

Notes

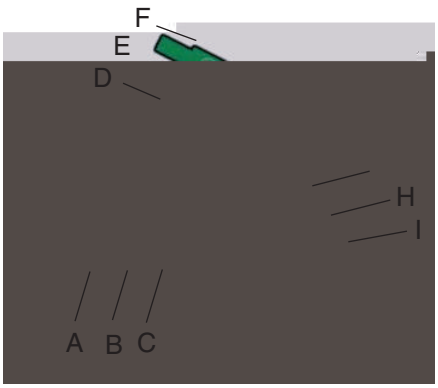
- Ground the shield drain wires (the black wire) only on the remote core processor end, by connecting it to the ground screw inside the lower conduit ring. Never ground to the core processor's mounting screw. Never ground the cable at the sensor junction box.
- Ground the cable braid on both ends, by terminating it inside the cable glands.

b. Tighten the screws to hold the wires in place.

c. Ensure integrity of gaskets, grease all O-rings, then replace the junction box cover and remote core processor end-cap and tighten all screws, as required.

5.7.1 Sensor and remote core processor terminals

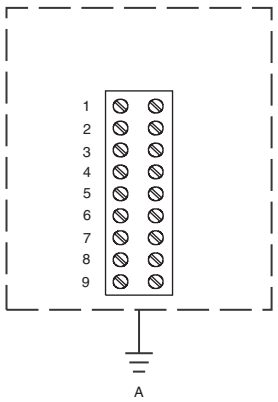
Figure 5-22: ELITE, H-Series, T-Series, and some F-Series sensor terminals



$ 9LROHW
% <HOORZ
& 2UDQJH
' %URZQ
(:KLWH
) *UHHQ
* 5HG
+ *UD\
, %OXH

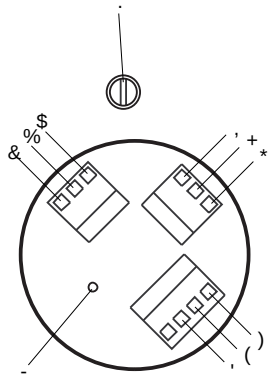
Figure 5-23: F-Series, Model D, and Model DL sensor terminals

Figure 5-24: Model DT sensor terminals (user-supplied metal junction box with terminal block)



$ (DUWK JURXQG

Figure 5-25: Remote core processor terminals

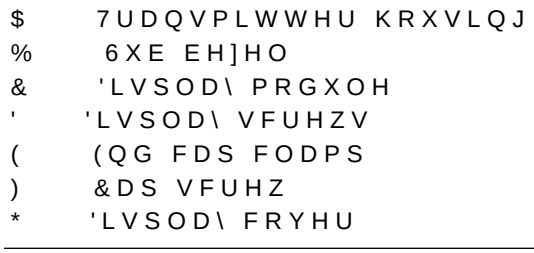


$ %URZQ
% 9LROHW
& <HOORZ
' 2UDQJH
(*UD\
) %OXH
* :KLWH
+ *UHHQ
, 5HG
- 0RXQWLQJ VFUHZ
. *URXQG VFUHZ EODFN

5.8 Rotate the user interface on the transmitter (optional)

The user interface on the transmitter electronics module can be rotated 90º or 180° from the original position.

Figure 5-26: Display components



Procedure

1. Shut off power to the unit.
2. Remove the end-cap clamp by removing the cap screw.
3. Turn the display cover counterclockwise to remove it from the main enclosure.
4. Carefully loosen (and remove if necessary) the semicaptive display screws while holding the display module in place.
5. Carefully pull the display module out of the main enclosure until the sub-bezel pin terminals are disengaged from the display module.

   Note

   If the display pins come out of the board stack with the display module, remove the pins and reinstall them.

6. Rotate the display module to the desired position.
7. Insert the sub-bezel pin terminals into the display module pin holes to secure the display in its new position.
8. If you have removed the display screws, line them up with the matching holes on the sub-bezel, then reinsert and tighten them.

9. Place the display cover onto the main enclosure.
10. Turn the display cover clockwise until it is snug.
11. Replace the end-cap clamp by reinserting and tightening the cap screw.
12. Restore power to the transmitter.

5.9 Ground the transmitter and remote core processor

In a remote core processor with remote sensor installation, the transmitter, remote core processor, and sensor are all grounded separately.

Prerequisites

CAUTION!

Improper grounding could cause inaccurate measurements or flow meter failure. Failure to comply with requirements for intrinsic safety in a hazardous area could result in an explosion.

If national standards are not in effect, adhere to the following guidelines for grounding:

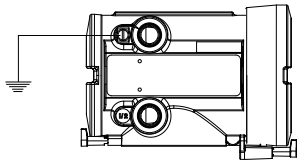
- Use copper wire, 14 AWG (2.5 mm^2) or larger wire size.
- Keep all ground leads as short as possible, less than 1 »impedance.
- Connect ground leads directly to earth, or follow plant standards.

Procedure

1. Ground the sensor according to the instructions in the sensor documentation.
2. Ground the transmitter according to applicable local standards, using the transmitter's internal or external ground screw.

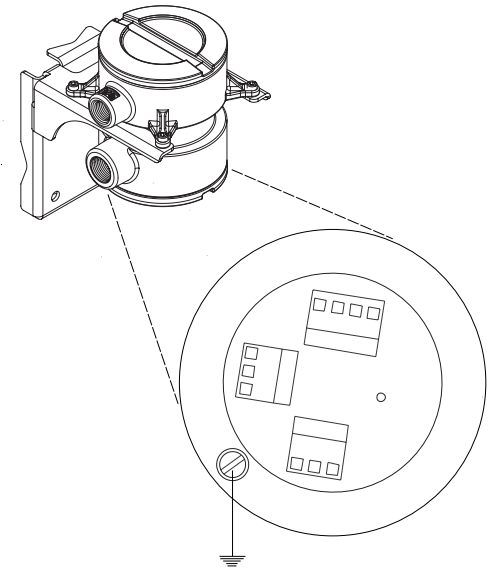
Figure 5-27: Transmitter internal grounding screw

Figure 5-28: Transmitter external grounding screw



3. Ground the remote core processor according to applicable local standards, using the remote core processor's internal ground screw.

Figure 5-29: Remote core processor internal ground screw



6 Wiring the power supply

6.1 Wire the power supply

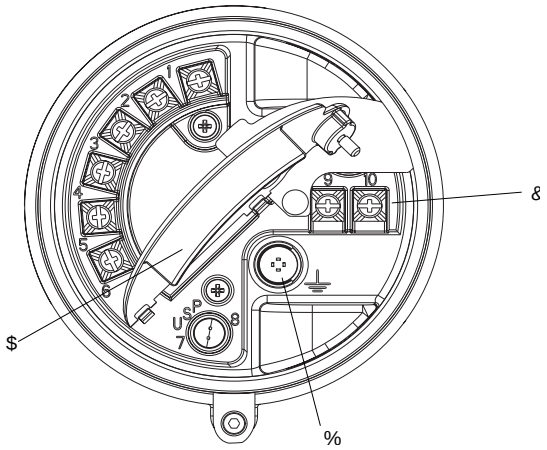
A user-supplied switch may be installed in the power supply line. For compliance with low-voltage directive 2006/95/EC (European installations), a switch in close proximity to the transmitter is required.

Procedure

1. Remove the transmitter housing cover.
2. Open the warning flap.
3. Connect the power supply wires to terminals 9 and 10.

   Terminate the positive (line) wire on terminal 10 and the return (neutral) wire on terminal 9.

Figure 6-1: Power supply wiring terminals



$:LULQJ IODS
% (TXLSPHQW JURXQG
& 3RZHU VXSSO\ ZLULQJ WHUPLQDOV DQG

4. Ground the power supply using the equipment ground, also under the warning flap.

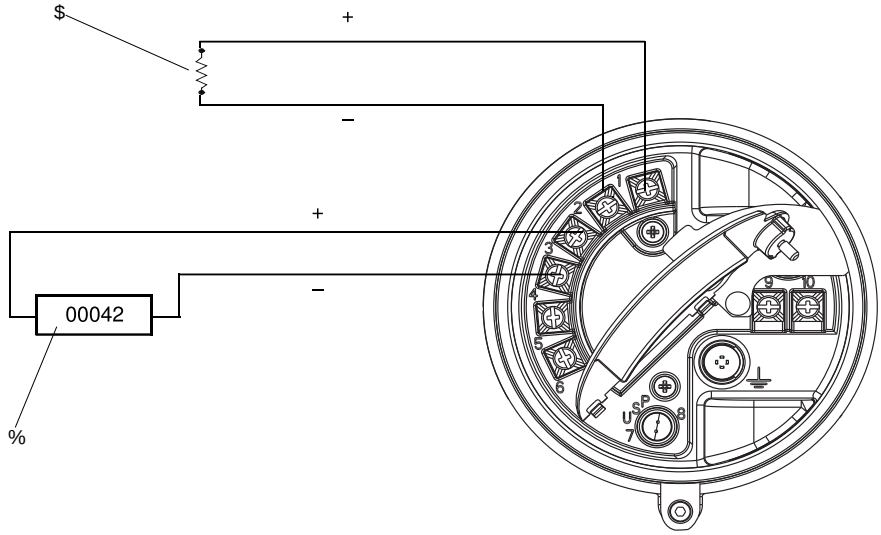
7 I/O wiring for Model 1700 and Model 2700 transmitters with analog outputs

Topics covered in this chapter:

- %DVLF DQDORJ ZLULQJ
- +$57 DQDORJ VLQJOH ORRS ZLULQJ
- 56 SRLQW WR SRLQW ZLULQJ
- +$57 PXOWLGURS ZLULQJ

7.1 Basic analog wiring

Figure 7-1: Basic analog wiring



$ P$ RXWSXW 0RRS XP ORRS UHVLVWDQFH
%)UHTXHQF\ UHFHLYLQJ GHYLFH RXWSXW YROWDJH OHYHO LV

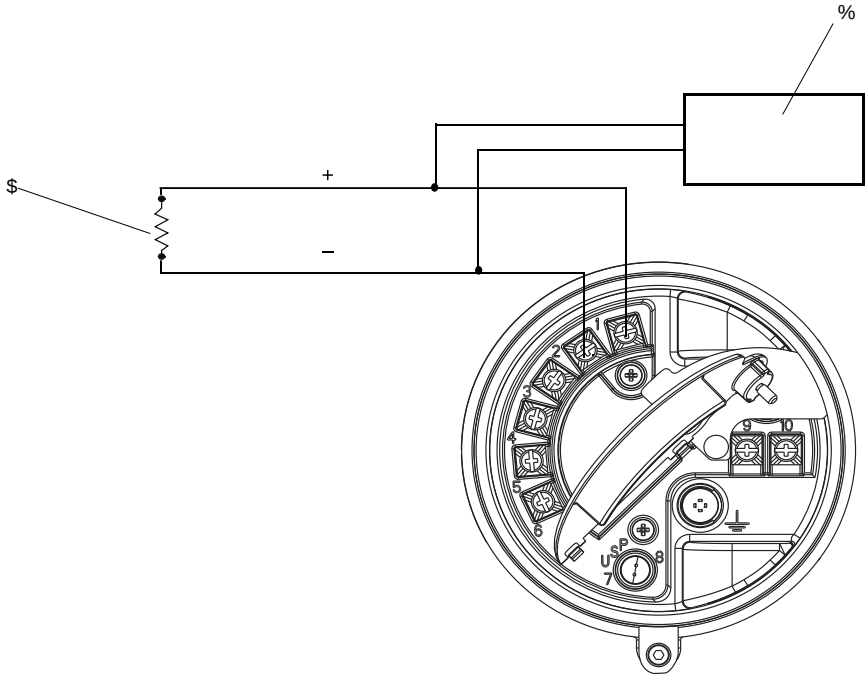
7.2 HART/analog single loop wiring

Note

For HART communications:

- »maximum loop resistance
- »minimum loop resistance

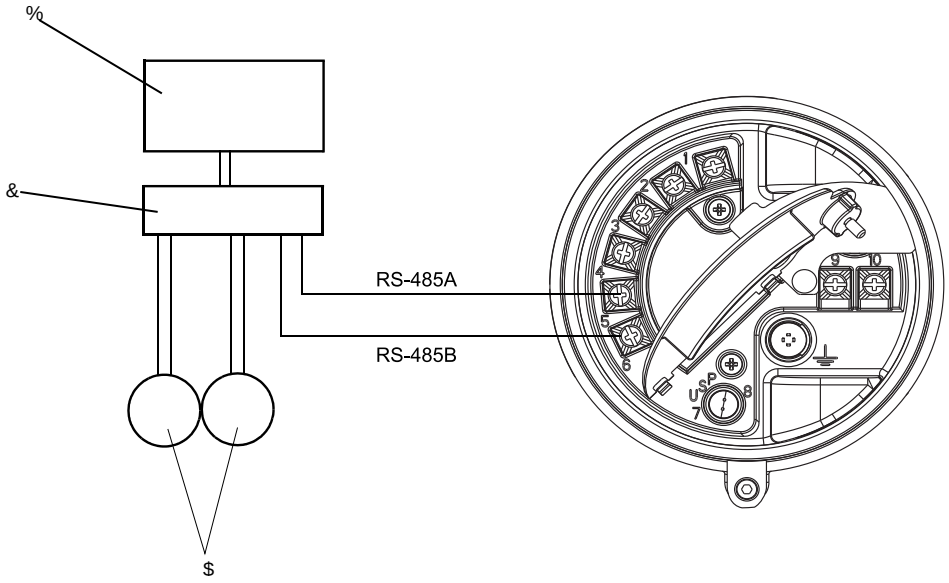
Figure 7-2: HART/analog single loop wiring



$ *820 Ω* PD[LPXP ORRS UHVLVWDQFH
% +$57 FRPSDWLEOH KRVW RU FRQWUROOHU

7.3 RS-485 point-to-point wiring

Figure 7-3: RS-485 point-to-point wiring



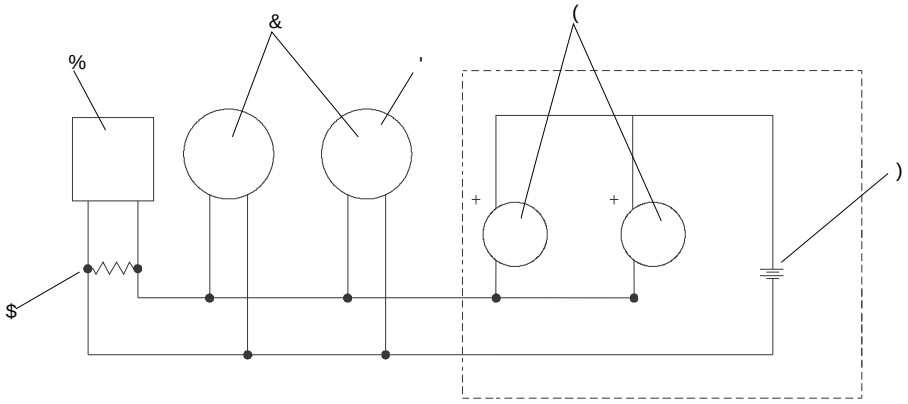
$ 2WKHU GHYLFHV
% 3ULPDU\ FRQWUROOHU
& 0XOWLSOH[HU

7.4 HART multidrop wiring

Tip

For optimum HART communication, single-point ground the output loop to an instrument-grade ground.

Figure 7-4: HART multidrop wiring



$ *250–600 Ω* UHVLVWDQFH
% +$57 FRPSDWLEOH KRVW RU FRQWUROOHU
& +$57 FRPSDWLEOH WUDQVPLWWHUV
' 0RGHO RU 0RGHO WUDQVPLWWHU
(60$57)$0LOOLDQVPLWWHUV
) 9'& ORRS SRZHU VXSSO\ UHTXLUHG IRU SDVVLYH WUDQVPLW

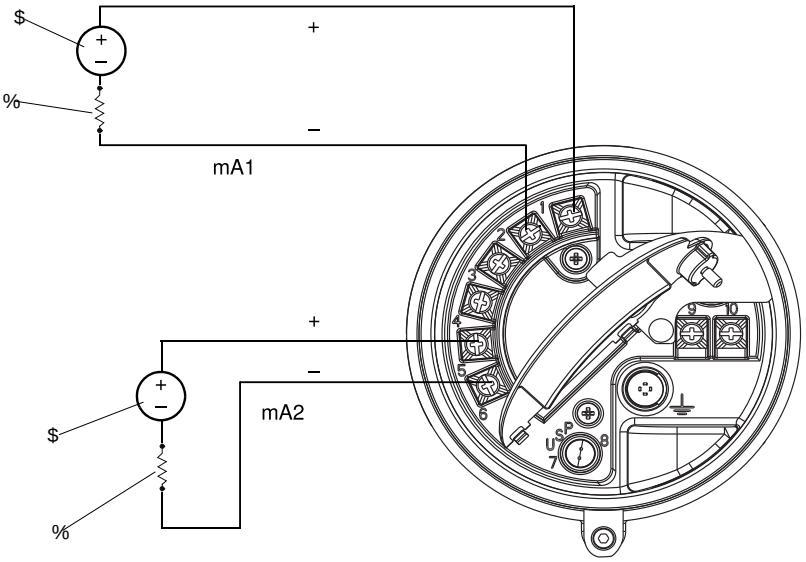
8 I/O wiring for Model 1700 and Model 2700 transmitters with intrinsically safe outputs

Topics covered in this chapter:

- 6DIH DUHD P$ RXWSXW ZLULQJ
- 6DIH DUHD +$57 DQDORJ VLQJOH ORRS ZLULQJ
- 6DIH DUHD +$57 PXOWLGURS ZLULQJ
- 6DIH DUHD IUHTXHQF\ RXWSXW GLVFUHWH RXWSXW
- +D]DUGRXV DUHD ZLULQJ

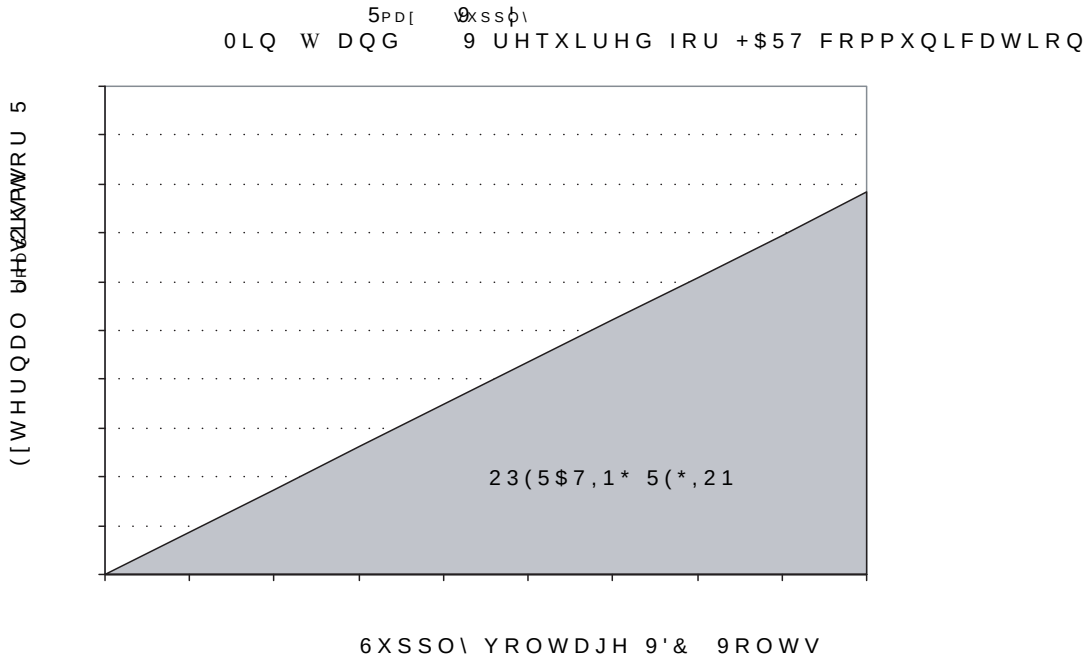
8.1 Safe area mA output wiring

Figure 8-1: Safe area mA output wiring



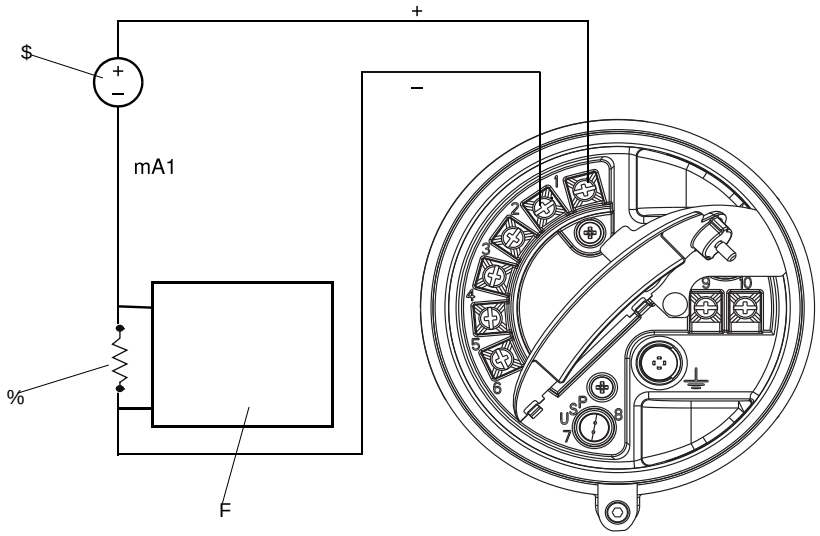
$ 9 ' &
% 5 O R D G

Figure 8-2: Safe area mA output load resistance values



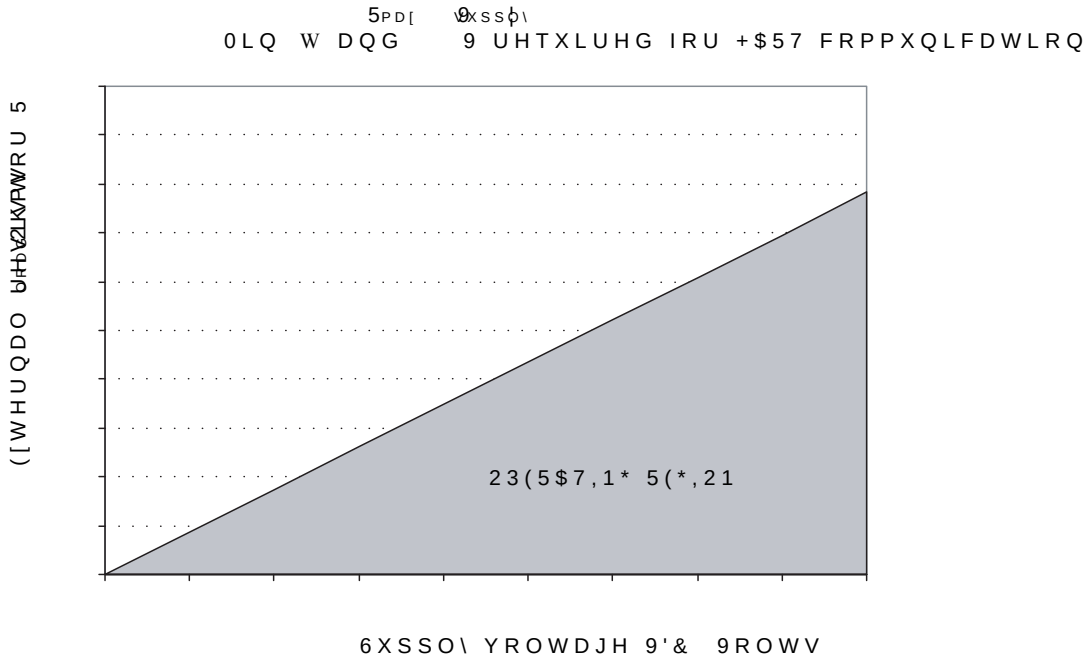
8.2 Safe area HART/analog single-loop wiring

Figure 8-3: Safe area HART/analog single-loop wiring



$ 9'&
% 5(250–600 Ω UHVLVWDQFH
& +$57 FRPSDWLEOH KRVW RU FRQWURROHU

Figure 8-4: Safe area mA output load resistance values

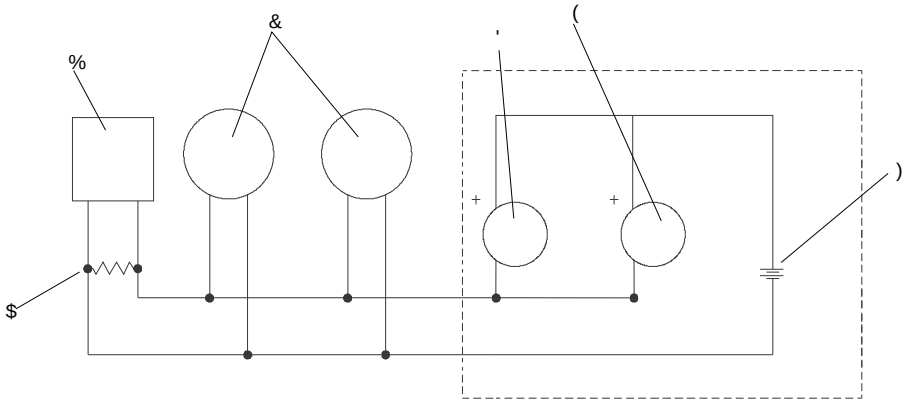


8.3 Safe area HART multidrop wiring

Tip

For optimum HART communication, single-point ground the output loop to an instrument-grade ground.

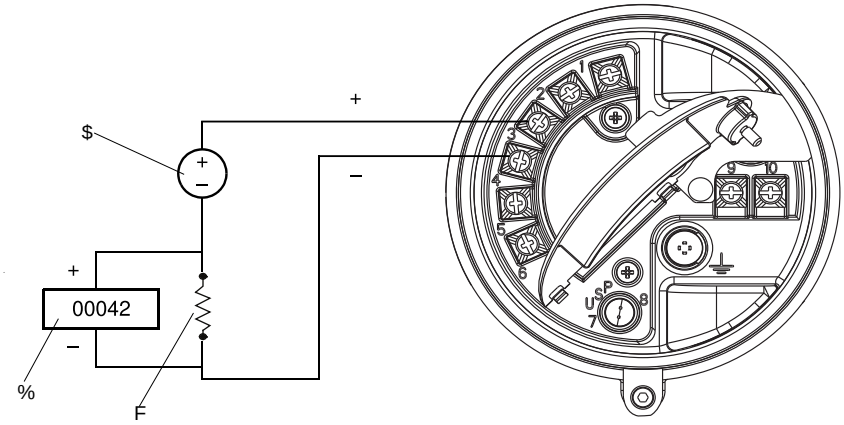
Figure 8-5: Safe area HART multidrop wiring



$ *250–600 Ω* UHVLVWDQFH
% +$57 FRPSDWLEOH KRVW RU FRQWUROOHU
& +$57 FRPSDWLEOH WUDQVPLWWHUV
' 0RGHO RU 0RGHO WUDQVPLWWHU ZLWK LQWULQVLFDOO\
(60$57)$0,/< WUDQVPLWWHU
) 9'& ORRS SRZHU VXSSO\ UHTXLUHG IRU +$57 z P$ SDVVLYH

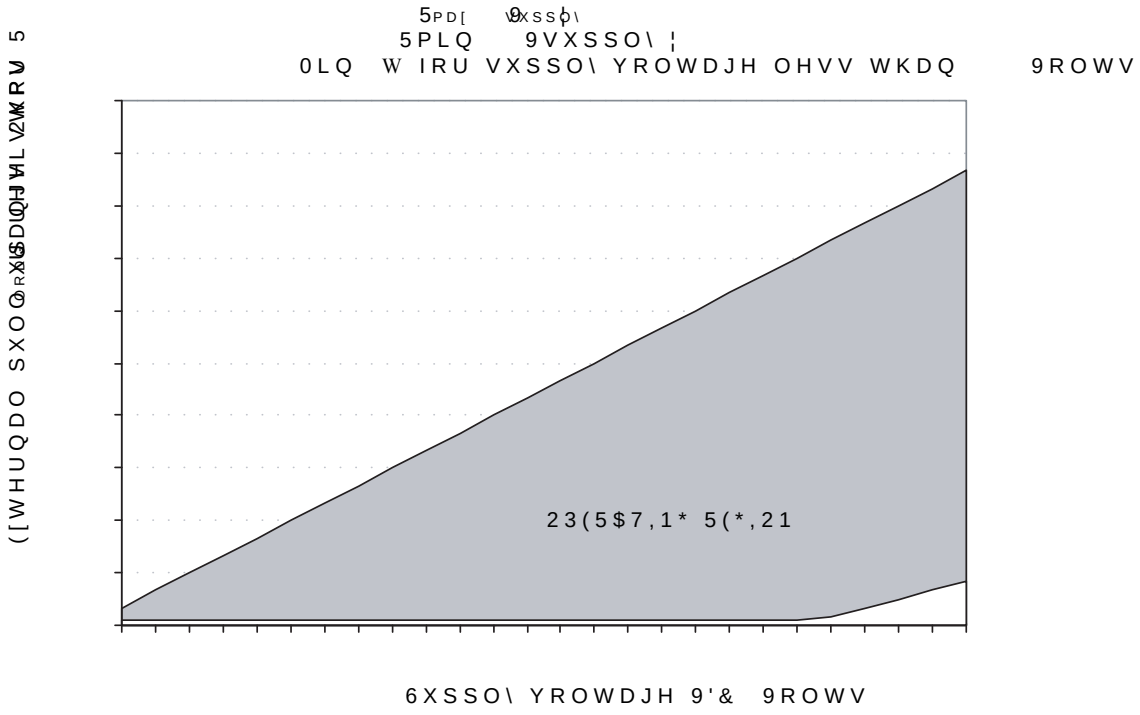
8.4 Safe area frequency output/discrete output wiring

Figure 8-6: Safe area frequency output/discrete output wiring



$ 9'&
% &RXQWHU
& 5RDG

Figure 8-7: Safe area frequency output/discrete output load resistance values



8.5 Hazardous area wiring

Information provided about I.S. barriers is intended as an overview. Application-specific or product-specific questions should be addressed to the barrier manufacturer or Micro Motion.

DANGER!

Hazardous voltage can cause severe injury or death. Shut off the power before wiring transmitter outputs.

DANGER!

Improper wiring in a hazardous environment can cause an explosion. Install the transmitter only in an area that complies with the hazardous classification tag on the transmitter.

Table 8-1: Safety parameters

Parameter	4–20 mA	Frequency/discrete
Voltage (U_i)	30 V	30 V
Current (I_i)	300 mA	100 mA
Power (P_i)	1.0 W	0.75 W

Table 8-1: Safety parameters F R Q W L Q X H G

Parameter	4–20 mA	Frequency/discrete
Capacitance (C_i)	ΗΗ	ΗΗ
Inductance (L_i)	0.0 mH	0.0 mH

Voltage The transmitter's safety parameters require the selected barrier's open-circuit voltage to be limited to less than 30 VDC (Vmax = 30 VDC). This voltage is the combination of the maximum safety barrier voltage (typically 28 VDC) plus an additional 2 VDC for HART communications when communicating in the hazardous area.

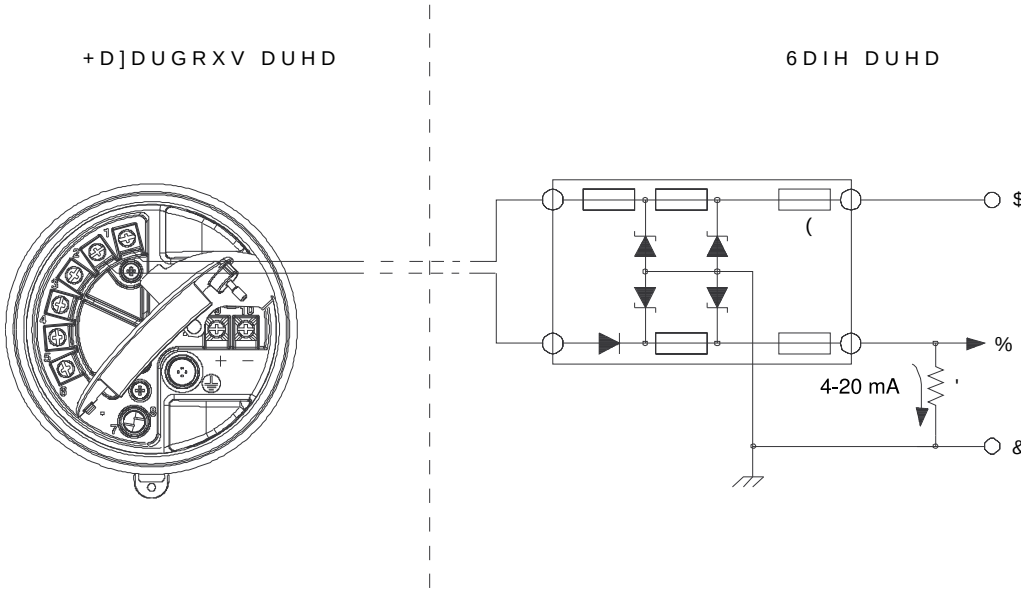
Current The transmitter's safety parameters require the selected barrier's short-circuit currents to sum to less than 300 mA (Imax = 300 mA) for the milliamp outputs and 100 mA (Imax = 100 mA) for the frequency/discrete output.

Capacitance The capacitance (Ci) of the transmitter is 0.0005 ΐF. This value added to the wire capacitance (Ccable) must be lower than the maximum allowable capacitance (Ca) specified by the I.S. barrier. Use the following equation to calculate the maximum length of the cable between the transmitter and the barrier: Ci + Ccable 7Ca

Inductance The inductance (Li) of the transmitter is 0.0 mH. This value plus the field wiring inductance (Lcable), must be lower than the maximum allowable inductance (La) specified by the I.S. barrier. The following equation can then be used to calculate the maximum cable length between the transmitter and the barrier: Li + Lcable 7La

8.5.1 Hazardous area mA output wiring

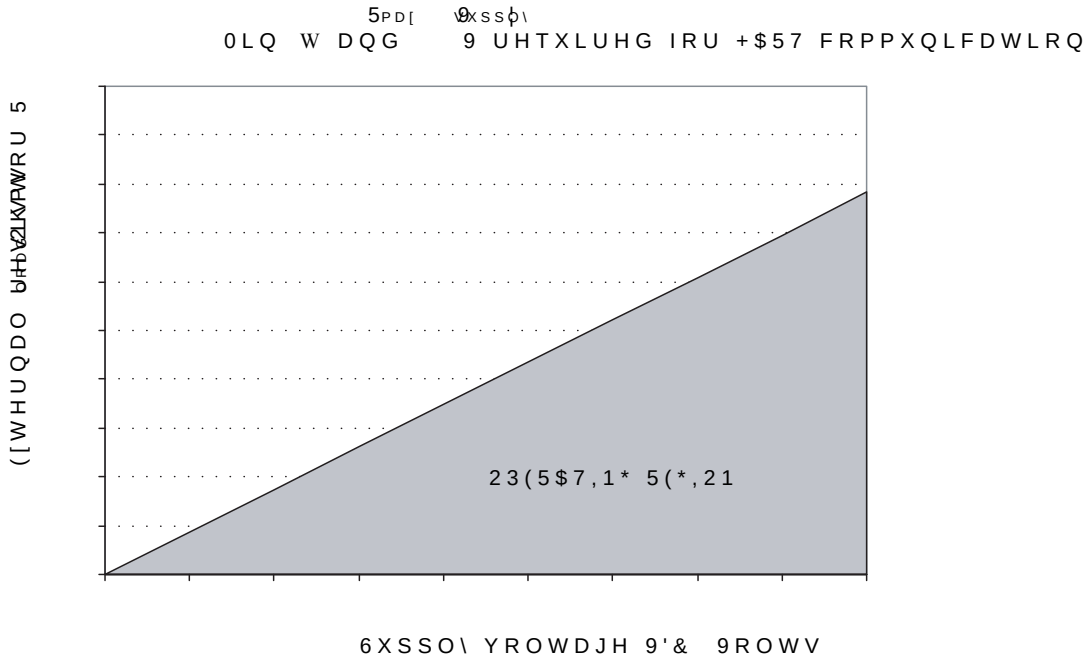
Figure 8-8: Hazardous area mA output wiring



$ 9Q
% 9RXW
& *URXQG
' 5ORDG
(5EDUULHU

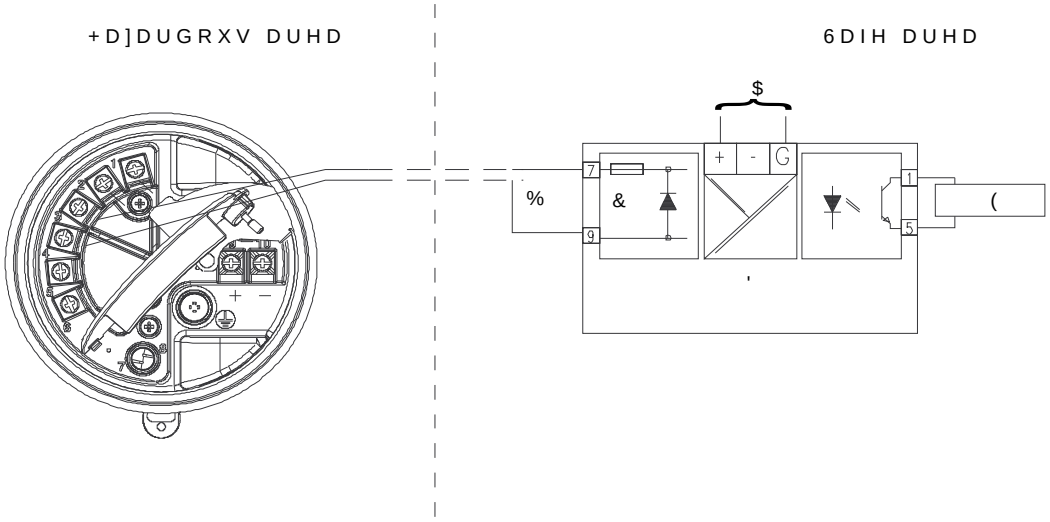
1RWH
$GG 5DQG 5WR GHWHUPLQH 9ORDG ED UULHU LQ

Figure 8-9: Safe area mA output load resistance values



8.5.2 Hazardous area frequency/discrete output wiring using galvanic isolator

Figure 8-10: Hazardous area frequency/discrete output wiring using galvanic isolator

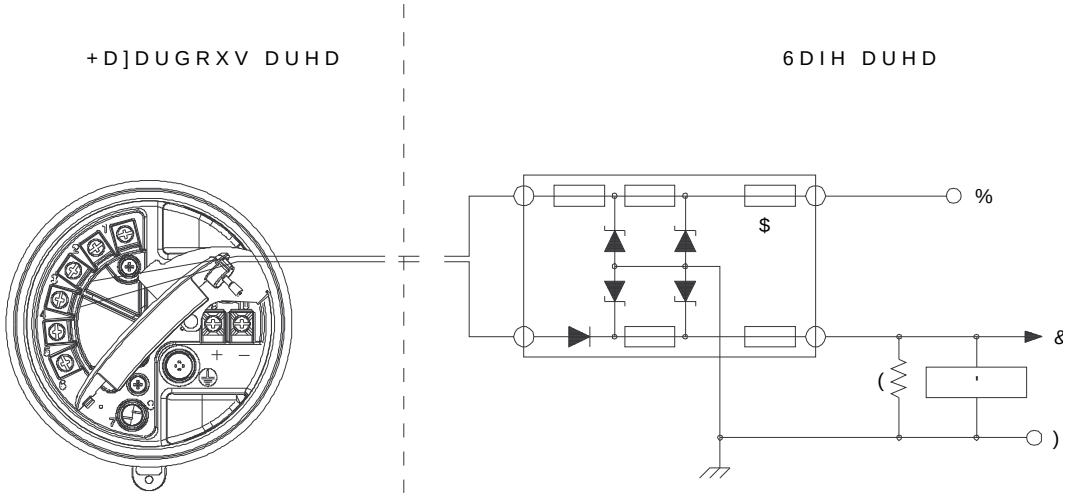


$ ([WHUQDO SRZHU VXSSO\
% 9RXW
& 5RDG
' *DOYDQLF LVRODWRU VHH QRWH
(&RXQWHU

1RWH
7KH JDOYDQLF LVRODWRU VKRXOG EH LQVWDOOHG LQ WKH VDIH DUHD XQOHVV LW LV VXLWDEOH IRU XVH LQ KD]DUGRXV DUHDV FXUUHQW
f 21 ! P$
f 2)) P$

8.5.3 Hazardous area frequency/discrete output wiring using barrier with external load resistance

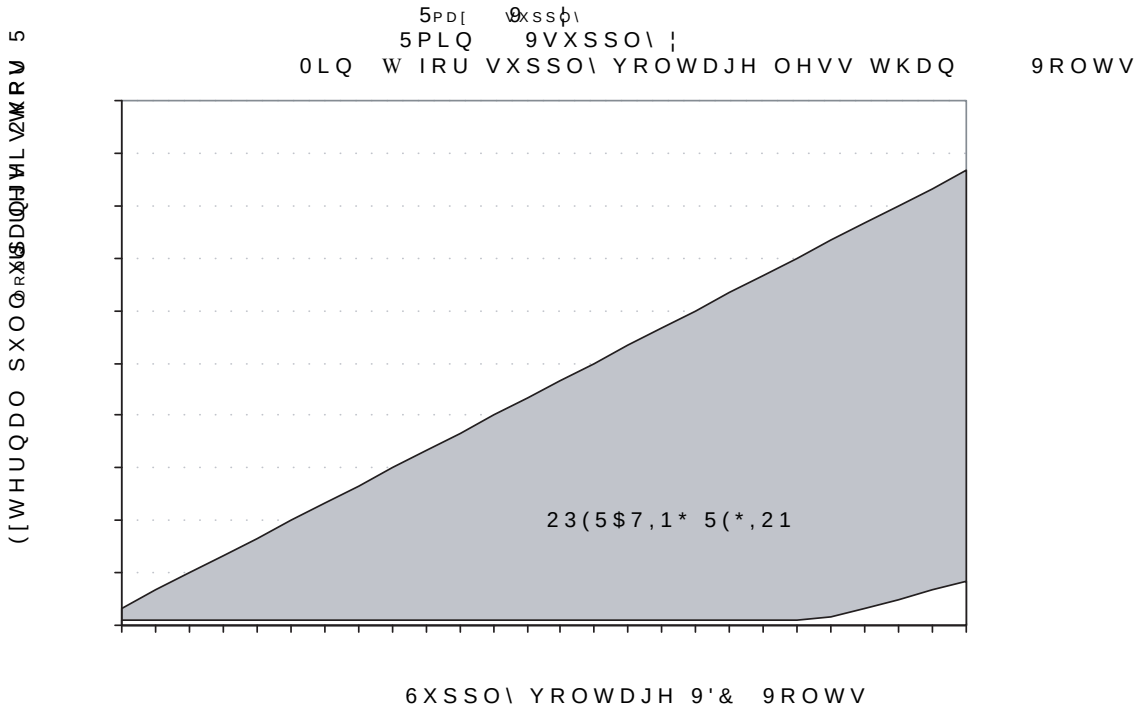
Figure 8-11: Hazardous area frequency/discrete output wiring using barrier with external load resistance



$ 5EDUULHU
% 9LQ
& 9RXW
' &RXQWHU
(5ORDG
) *URXQG

1RWH
$GG 5EDUULHU WR GHWHUPLQH 9LQ

Figure 8-12: Safe area frequency output/discrete output load resistance values



9 I/O wiring for Model 2700 transmitters with configurable input/outputs

Topics covered in this chapter:

- &KDQQHO FRQILJXUDWLRQ
- %DVLF P$ RXWSXW ZLULQJ
- +$57 DQDORJ VLQJOH ORRS ZLULQJ
- +$57 PXOWLGURS ZLULQJ
- ,QWHUQDOO\ SRZHUHG IUHTXHQF\ RXWSXW ZLULQJ
- ([WHUQDOO\ SRZHUHG IUHTXHQF\ RXWSXW ZLULQJ
- ,QWHUQDOO\ SRZHUHG IUHTXHQF\ RXWSXW ZLULQJ
- ([WHUQDOO\ SRZHUHG IUHTXHQF\ RXWSXW ZLULQJ
- ,QWHUQDOO\ SRZHUHG GLVFUHWH RXWSXW ZLULQJ
- ([WHUQDOO\ SRZHUHG GLVFUHWH RXWSXW ZLULQJ
- ,QWHUQDOO\ SRZHUHG GLVFUHWH RXWSXW ZLULQJ
- ([WHUQDOO\ SRZHUHG GLVFUHWH RXWSXW ZLULQJ
- ,QWHUQDOO\ SRZHUHG GLVFUHWH LQSXW ZLULQJ
- ([WHUQDOO\ SRZHUHG GLVFUHWH LQSXW ZLULQJ

9.1 Channel configuration

The six wiring terminals are divided into three pairs, and called Channels A, B, and C. Channel A is terminals 1 and 2; Channel B is terminals 3 and 4; and Channel C is terminals 5 and 6. Variable assignments are governed by channel configuration.

Table 9-1: Channel configuration

Channel	Terminals	Configuration options	Power
A	1, 2	mA output with HART/Bell202	Internal
B	3, 4	mA output (default)	Internal
		Frequency output	Internal or external
		Discrete output	Internal or external
C	5, 6	Frequency output (default)	Internal or external
		Discrete output	Internal or external

Table 9-1: Channel configuration F R Q W L Q X H G

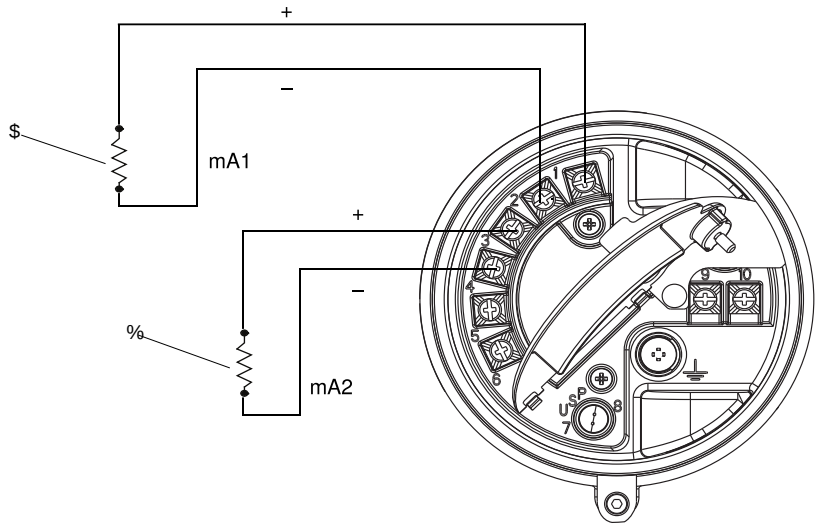
Channel	Terminals	Configuration options	Power
		Discrete input	Internal or external

Notes

- For Channel A, the Bell 202 signal is superimposed on the mA output.
- You must provide power to the outputs when a channel is set to external power.
- When both Channel B and Channel C are configured for frequency output (dual pulse), frequency output 2 is generated from the same signal that is sent to the first frequency output. Frequency output 2 is electrically isolated but not independent.
- You cannot configure the combination of Channel B as discrete output and Channel C as frequency output.

9.2 Basic mA output wiring

Figure 9-1: Basic mA output wiring



$ *820 Ω* P D [L P X P O R R S U H V L V W D Q F H
% *420 Ω* P D [L P X P O R R S U H V L V W D Q F H

9.3 HART/analog single loop wiring

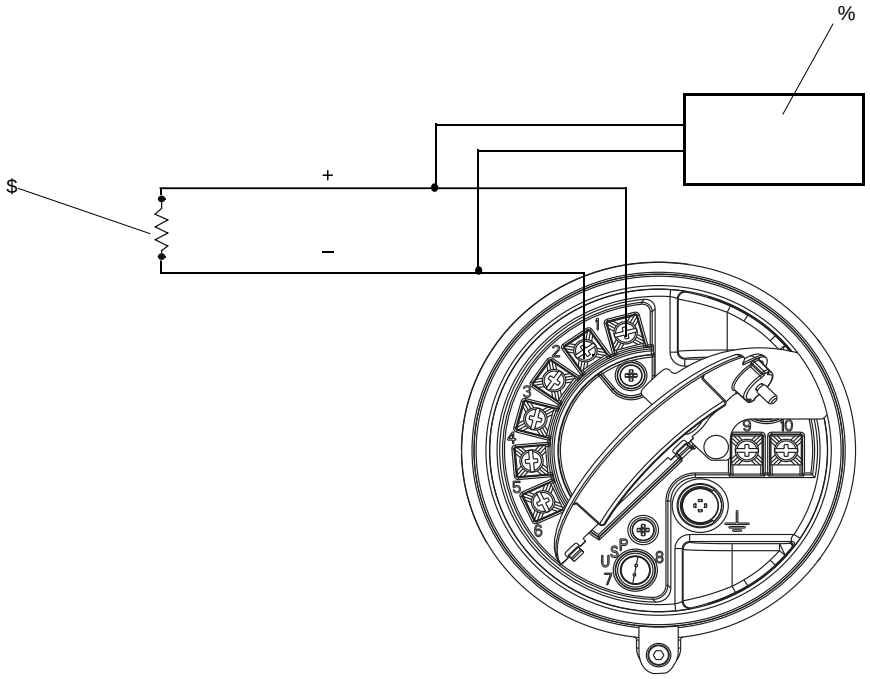
Note

For HART communications:

- »maximum loop resistance

- »minimum loop resistance

Figure 9-2: HART/analog single loop wiring



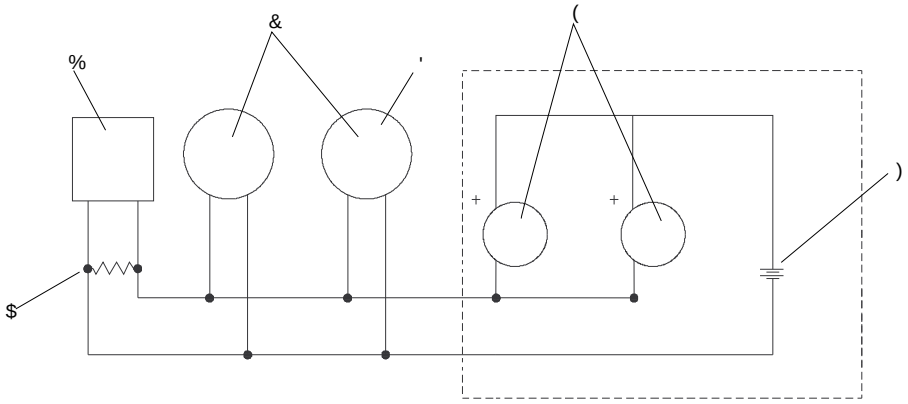
$ *820 Ω* PD[LPXP ORRS UHVLVWDQFH
% +$57 FRPSDWLEOH KRVW RU FRQWUROOHU

9.4 HART multidrop wiring

Tip

For optimum HART communication, single-point ground the output loop to an instrument-grade ground.

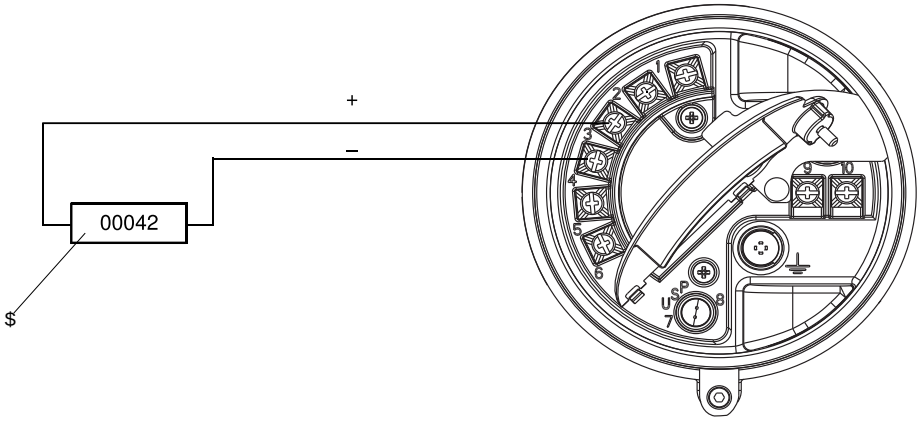
Figure 9-3: HART multidrop wiring



$ *250–600 Ω* UHVLVWDQFH
% +$57 FRPSDWLEOH KRVW RU FRQWUROOHU
& +$57 FRPSDWLEOH WUDQVPLWWHUV
' 0RGHO FRQILJXUDEOH , 2 WUDQVPLWWHU LQWHUQDOO\ SRZ
(60$57)$0,/< WUDQVPLWWHUV
) 9'& ORRS SRZHU VXSSO\ UHTXLUHG IRU +$57 z P$ SDVVLYH

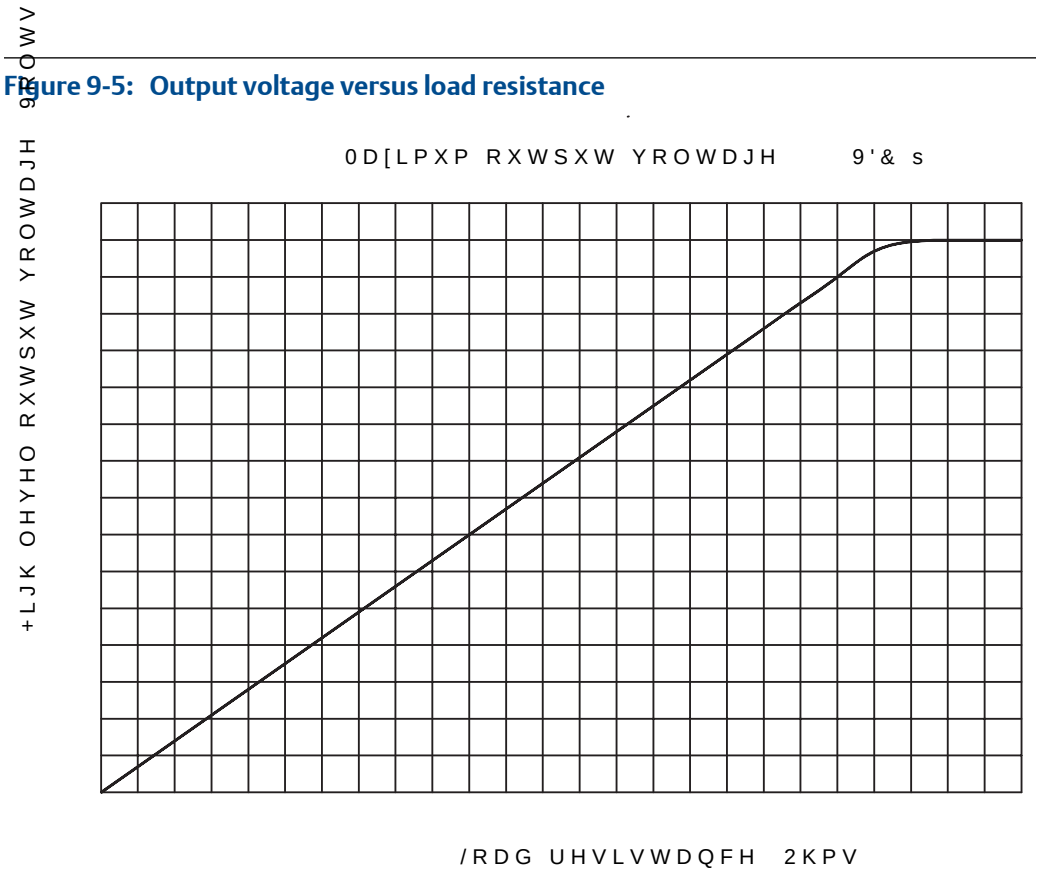
9.5 Internally powered frequency output wiring on Channel B

Figure 9-4: Internally powered frequency output wiring on Channel B



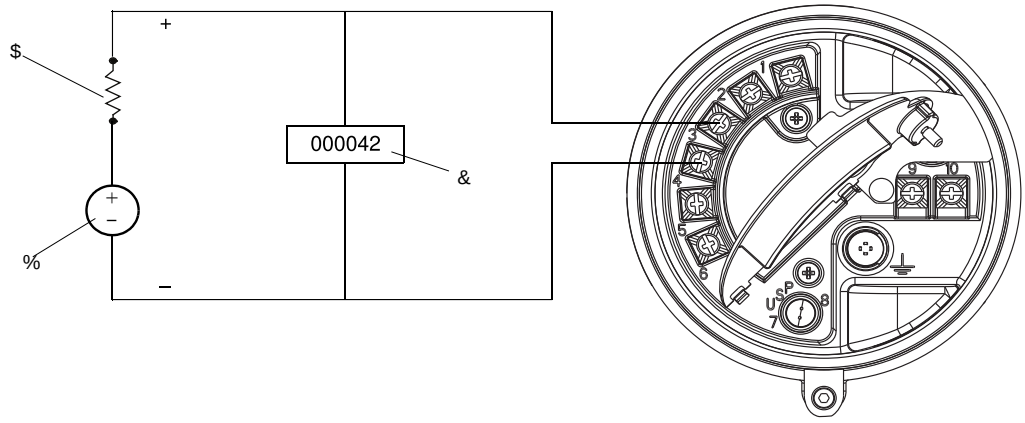
$ &RXQWHU

Figure 9-5: Output voltage versus load resistance



9.6 Externally powered frequency output wiring on Channel B

Figure 9-6: Externally powered frequency output wiring on Channel B

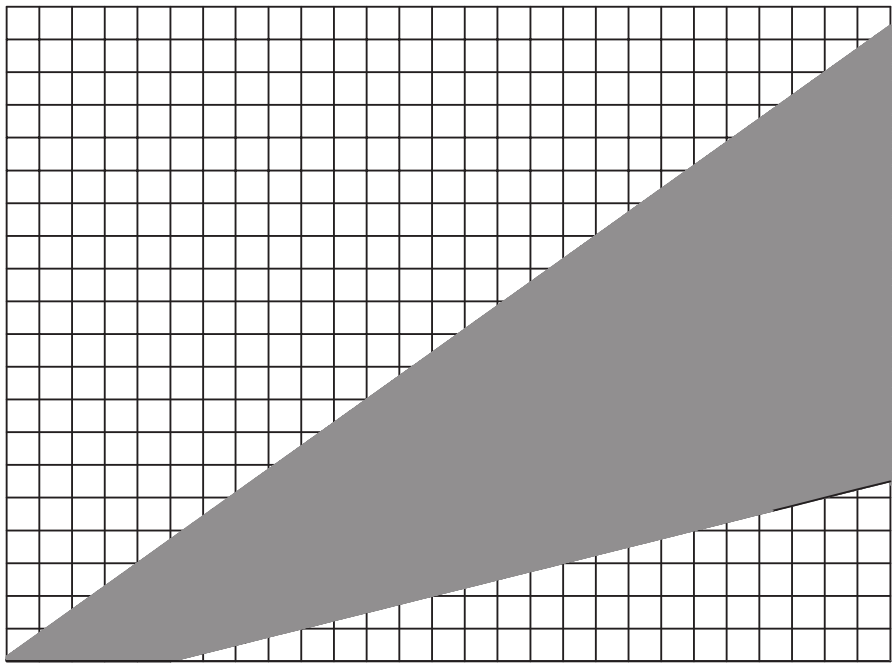


$ 3XOO XS UHVLVWRU
% z 9'&
& &RXQWHU

CAUTION!

Exceeding 30 VDC can damage the transmitter. Terminal current must be less than 500 mA.

Figure 9-7: Recommended pull-up resistor versus supply voltage



9.7 Internally powered frequency output wiring on Channel C

Figure 9-8: Internally powered frequency output wiring on Channel C

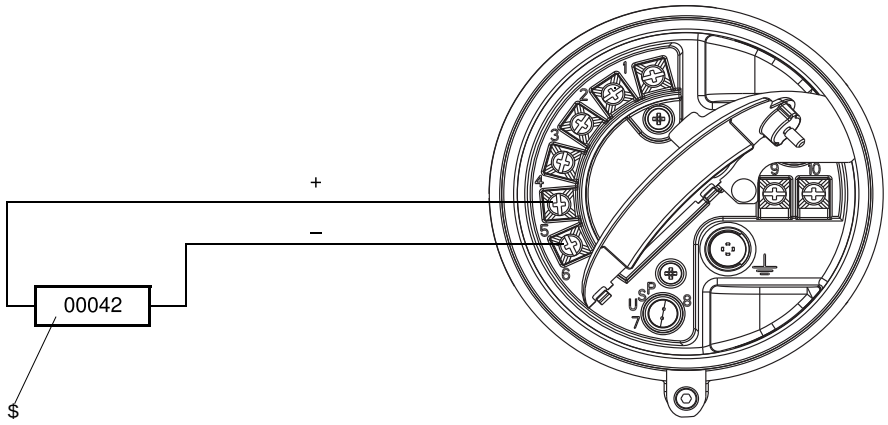
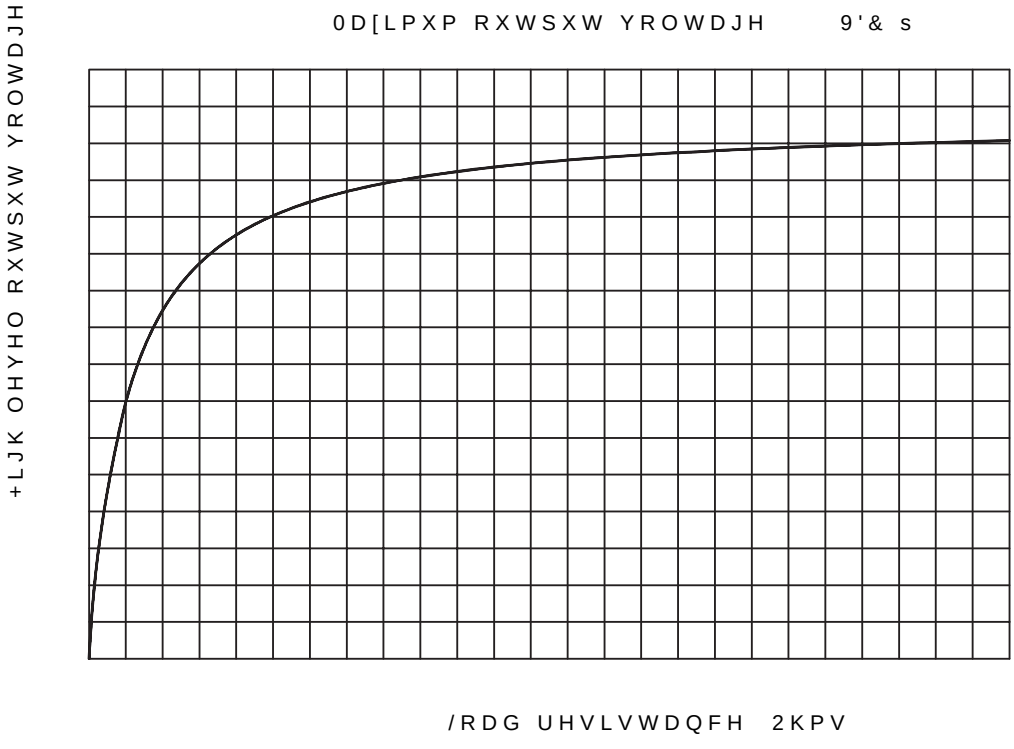


Figure 9-9: Output voltage versus load resistance



9.8 Externally powered frequency output wiring on Channel C

Figure 9-10: Externally powered frequency output wiring on Channel C